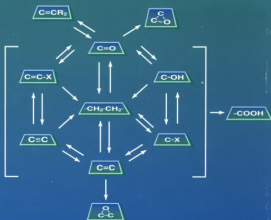


# Compendium of Organic Synthetic Methods

Volume 10



Michael B. Smith

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Volume 10

MICHAEL B. SMITH

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THE UNIVERSITY OF CONNECTICUT  
STORRS, CONNECTICUT

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# PREFACE

Since the original volume in this series by Ian and Shuyen Harrison, the goal of the *Compendium of Organic Synthetic Methods* was to facilitate the search for functional group transformations in the original literature of Organic Chemistry. In Volume 2, difunctional compounds were added and this compilation was continued by Louis Hegedus and Leroy Wade for Volume 3 of the series. Wade became the author for Volume 4 and continued with Volume 5. I began editing the series with Volume 6, where I introduced an author index for the first time and added a new chapter (Chapter 15, Oxides). Volume 7 introduced Sections 378 (Oxides - Alkynes) through Section 390 (Oxides - Oxides). The *Compendium* is a handy desktop reference that will remain a valuable tool to the working Organic chemist, allowing a "quick check" of the literature. It also allows one to "browse" for new reactions and transformations that may be of interest. The body of Organic literature is very large and the *Compendium* is a focused and highly representative review of the literature and is offered in that context.

*Compendium of Organic Synthetic Methods, Volume 10* contains both functional group transformations and carbon-carbon bond forming reactions from the literature appearing in the years 1996, 1997 and 1998. The classification schemes used for volumes 6-9 have been continued. Difunctional compounds appear in Chapter 16. The experienced user of the *Compendium* will require no special instructions for the use of Volume 10. Author citations and the Author Index have been continued as in Volumes 6-9.

Every effort has been made to keep the manuscript error free. Where there are errors, I take full responsibility. If there are questions or comments, the reader is encouraged to contact me directly at the address, phone, fax, or Email addresses given below.

As I have throughout my writing career, I thank my wife Sarah and my son Steven who have shown unfailing patience and devotion during this work. I also thank Dr. Darla Henderson, the editor for this volume.

Michael B. Smith

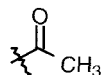
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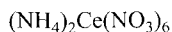
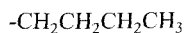
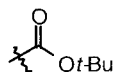
# ABBREVIATIONS

Ac Acetyl  
acac Acetylacetonate  
AIBN *azo-bis-isobutyronitrile*  
aq. Aqueous

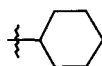
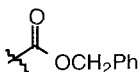


9-BBN 9-Borabicyclo[3.3.1]nonyl  
BER 9-Borabicyclo[3.3.1]nonane  
BINAP Borohydride exchange resin  
BINAP *2R,3S-2,2'-bis-(diphenylphosphino)-1,1'-binaphthyl*  
Bn benzyl  
Bz benzoyl

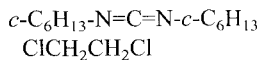
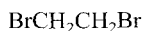
BOC *t*-Butoxycarbonyl  
bpy (Bipy) 2,2'-Bipyridyl  
Bu *n*-Butyl  
CAM Carboxamidomethyl  
CAN Ceric ammonium nitrate  
c- cyclo-  
cat. Catalytic

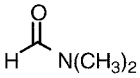






Cbz Carbobenzyloxy  
Chirald 2S,3R-(+)-4-dimethylamino-1,2-diphenyl-3-methylbutan-2-ol  
COD 1,5-Cyclooctadienyl  
COT 1,3,5-cyclooctatrienyl  
Cp Cyclopentadienyl  
CSA Camphorsulfonic acid  
CTAB cetyltrimethylammonium bromide



Cy (*c*-C<sub>6</sub>H<sub>11</sub>) Cyclohexyl  
°C Temperature in Degrees Centigrade  
DABCO 1,4-Diazabicyclo[2.2.2]octane  
dba dibenzylidene acetone  
DBE 1,2-Dibromoethane  
DBN 1,8-Diazabicyclo[5.4.0]undec-7-ene  
DBU 1,5-Diazabicyclo[4.3.0]non-5-ene  
DCC 1,3-Dicyclohexylcarbodiimide  
DCE 1,2-Dichloroethane  
DDQ 2,3-Dichloro-5,6-dicyano-1,4-benzoquinone  
% de % Diastomeric excess  
DEA Diethylamine



DEAD	Diethylazodicarboxylate	$\text{EtO}_2\text{C-N=NCO}_2\text{Et}$
Dibal-H	Diisobutylaluminum hydride	$(\text{Me}_2\text{CHCH}_2)_2\text{AlH}$
Diphos (dppe)	1,2- <i>bis</i> -(Diphenylphosphino)ethane	$\text{Ph}_2\text{PCH}_2\text{CH}_2\text{PPh}_2$
Diphos-4 (dppb)	1,4- <i>bis</i> -(Diphenylphosphino)butane	$\text{Ph}_2\text{P}(\text{CH}_2)_4\text{PPh}_2$
DMAP	4-Dimethylaminopyridine	
DMA	Dimethylacetamide	
DME	Dimethoxyethane	$\text{MeOCH}_2\text{CH}_2\text{OMe}$
DMF	<i>N,N'</i> -Dimethylformamide	
dmp	<i>bis</i> -[1,3-Di(p-methoxyphenyl)-1,3-propanedionato]	
dpm	dipivaloylmethanato	
dppb	1,4- <i>bis</i> -(Diphenylphosphino)butane	$\text{Ph}_2\text{P}(\text{CH}_2)_4\text{PPh}_2$
dppe	1,2- <i>bis</i> -(Diphenylphosphino)ethane	$\text{Ph}_2\text{PCH}_2\text{CH}_2\text{PPh}_2$
dppf	<i>bis</i> -(Diphenylphosphino)ferrocene	
dppp	1,3- <i>bis</i> -(Diphenylphosphino)propane	$\text{Ph}_2\text{P}(\text{CH}_2)_3\text{PPh}_2$
dvb	Divinylbenzene	
e	Electrolysis	
% ee	% Enantiomeric excess	
EE	1-Ethoxyethoxy	$\text{EtO}(\text{Me})\text{CH-}$
Et	Ethyl	$-\text{CH}_2\text{CH}_3$
EDA	Ethylenediamine	$\text{H}_2\text{NCH}_2\text{CH}_2\text{NH}_2$
EDTA	Ethylenediaminetetraacetic acid	
FMN	Flavin mononucleotide	
fod	<i>tris</i> -(6,6,7,7,8,8,8)-Heptafluoro-2,2-dimethyl-3,5-octanedionate	
Fp	Cyclopentadienyl- <i>bis</i> -carbonyl iron	
FVP	Flash Vacuum Pyrolysis	
h	hour (hours)	
hν	Irradiation with light	
1,5-HD	1,5-Hexadienyl	
HMPA	Hexamethylphosphoramide	$(\text{Me}_2\text{N})_3\text{P=O}$
HMPT	Hexamethylphosphorus triamide	$(\text{Me}_2\text{N})_3\text{P}$
iPr	Isopropyl	$-\text{CH}(\text{CH}_3)_2$
LICA (LIPCA)	Lithium cyclohexylisopropylamide	
LDA	Lithium diisopropylamide	$\text{LiN}(\text{iPr})_2$
LHMDS	Lithium hexamethyl disilazide	$\text{LiN}(\text{SiMe}_3)_2$
LTMP	Lithium 2,2,6,6-tetramethylpiperidide	
MABR	Methylaluminum <i>bis</i> -(4-bromo-2,6-di- <i>tert</i> -butylphenoxide)	
MAD	<i>bis</i> -(2,6-di- <i>t</i> -butyl-4-methylphenoxy)methyl aluminum	
mCPBA	<i>meta</i> -Chloroperoxybenzoic acid	
Me	Methyl	$-\text{CH}_3$
MEM	β-Methoxyethoxymethyl	$\text{MeOCH}_2\text{CH}_2\text{OCH}_2-$
Mes	Mesityl	2,4,6-tri-Me- $\text{C}_6\text{H}_2$
MOM	Methoxymethyl	$\text{MeOCH}_2-$
Ms	Methanesulfonyl	$\text{CH}_3\text{SO}_2-$
MS	Molecular Sieves (3Å or 4Å)	
MTM	Methylthiomethyl	$\text{CH}_3\text{SCH}_2-$
NAD	Nicotinamide adenine dinucleotide	
NADP	Sodium triphosphopyridine nucleotide	

Naph	Naphthyl (C <sub>10</sub> H <sub>8</sub> )	
NBD	Norbornadiene	
NBS	<i>N</i> -Bromosuccinimide	
NCS	<i>N</i> -Chlorosuccinimide	
NIS	<i>N</i> -Iodosuccinimide	
Ni(R)	Raney nickel	
NMP	<i>N</i> -Methyl-2-pyrrolidinone	
Oxone	2 KHSO <sub>5</sub> ·KHSO <sub>4</sub> ·K <sub>2</sub> SO <sub>4</sub>	
	Polymeric backbone	
PCC	Pyridinium chlorochromate	
PDC	Pyridinium dichromate	
PEG	Polyethylene glycol	
Ph	Phenyl	
PhH	Benzene	
PhMe	Toluene	
Phth	Phthaloyl	
pic	2-Pyridinecarboxylate	
Pip	Piperidino	
PMP	4-methoxyphenyl	
Pr	<i>n</i> -Propyl	-CH <sub>2</sub> CH <sub>2</sub> CH <sub>3</sub>
Py	Pyridine	
quant.	Quantitative yield	
Red-Al	[(MeOCH <sub>2</sub> CH <sub>2</sub> O) <sub>2</sub> AlH <sub>2</sub> ] <sub>3</sub> Na	
sBu	<i>sec</i> -Butyl	CH <sub>3</sub> CH <sub>2</sub> CH(CH <sub>3</sub> )
sBuLi	<i>sec</i> -Butyllithium	CH <sub>3</sub> CH <sub>2</sub> CH(Li)CH <sub>3</sub>
Siamyl	Diisoamyl	(CH <sub>3</sub> ) <sub>2</sub> CHCH(CH <sub>3</sub> )-
TADDOL	α,α,α',α'-tetraaryl-4,5-dimethoxy-1,3-dioxolane	
TASF	<i>tris</i> -(Diethylamino)sulfonium difluorotrimethyl silicate	
TBAF	Tetrabutylammonium fluoride	<i>n</i> -Bu <sub>4</sub> N <sup>+</sup> F <sup>-</sup>
TBDMS	<i>t</i> -Butyldimethylsilyl	<i>t</i> -BuMe <sub>2</sub> Si
TBHP ( <i>t</i> -BuOOH)	<i>t</i> -Butylhydroperoxide	Me <sub>3</sub> COOH
<i>t</i> -Bu	<i>tert</i> -Butyl	-C(CH <sub>3</sub> ) <sub>3</sub>
TEBA	Triethylbenzylammonium	Bn(Et) <sub>3</sub> N <sup>+</sup>
TEMPO	Tetramethylpiperdinyloxy free radical	
TFA	Trifluoroacetic acid	CF <sub>3</sub> COOH
TFAA	Trifluoroacetic anhydride	(CF <sub>3</sub> CO) <sub>2</sub> O
Tf (OTf)	Triflate	-SO <sub>2</sub> CF <sub>3</sub> (-OSO <sub>2</sub> CF <sub>3</sub> )
THF	Tetrahydrofuran	
THP	Tetrahydropyran	
TMEDA	Tetramethylethylenediamine	Me <sub>2</sub> NCH <sub>2</sub> CH <sub>2</sub> NMe <sub>2</sub>
TMG	1,1,3,3-Tetramethylguanidine	
TMS	Trimethylsilyl	-Si(CH <sub>3</sub> ) <sub>3</sub>
TMP	2,2,6,6-Tetramethylpiperidine	
TPAP	tetra- <i>n</i> -Propylammonium perruthenate	

Tol	Tolyl	$4\text{-C}_6\text{H}_4\text{CH}_3$
Tr	Trityl	$\text{-CPh}_3$
TRIS	Triisopropylphenylsulfonyl	
Ts(Tos)	Tosyl = <i>p</i> -Toluenesulfonyl	$4\text{-MeC}_6\text{H}_4\text{SO}_2$
X <sub>c</sub>	Chiral auxiliary	

# INDEX, MONOFUNCTIONAL COMPOUNDS

Sections—heavy type

Pages—light type

## PROTECTION

	Sect.	Pg.
Carboxylic acids	30A	11
Alcohols, phenols	45A	40
Aldehydes	60A	54
Amides	90A	117
Amines	105A	138
Ketones	180A	203

Blanks in the table correspond to sections for which no additional examples were found in the literature

REPARATION OF															
FROM															
		Alkynes	Carboxylic acid derivatives	Alcohols, phenols	Aldehydes	Alkyls, methylenes, aryls	Amides	Amines	Esters	Ethers, epoxides	Halides, sulfonates	Hydrides (RH)	Ketones	Nitriles	Alkenes
Alkynes	1				61	76	91	106	121				166	196	
	1				57	100	118	139	157				183	212	
Carboxylic acid derivatives		17	32	47		77		107			152	167	182		212
		8	12	45		100		139			177	183	207		229
Alcohols, phenols		18	33	48		78		108	123	138	153	168		198	213
		8	12	46		101		141	157	170	177	185		213	229
Aldehydes		19	34		64	79	94	109	124			169	184	199	
		8	13		60	102	118	145	158			187	207	214	
Alkyls, methylenes, aryls	6	20	35	50	65	80				140		170			215
	3	8	26	50	60	102				171		188			230
Amides			36	51		81	96	111				171	186		
			27	50		103	120	146				190	207		
Amines			37			82	97			142	157	172	187		217
			27			108	121			173	178	190	207		231
Esters	8		38		68	83	98	113			158	173			203
	4		28		63	111	127	147			178	190			218
Ethers, epoxides			39	54	69		99	114	129		159	174		204	219
			28	51	64		127	149	160		179	192		218	231
Halides, sulfonates	10	25	40	55	70	85	100	115	130	145	160	175	190	205	220
	4	9	32	52	65	111	128	150	161	174	180	192	208	219	236
Hydrides (RH)	11		41	56		86		116		146		176			
	5		33	52		112		152		174		194			
Ketones	12	27	42		72	87	102	117	132	147	162	177		207	
	5	10	34		71	113	131	153	163	175	181	194		222	
Nitriles					73	88	103				163				
					72	113	131				182				
Alkenes		29	44	59	74	89	104	119	134	149		179	194	209	
		10	39	53	72	114	132	155	163	175		198	209	223	
Miscellaneous				60	75	90	105	120	135	150	165	180	195	210	225
				54	97	115	133	156	169	176	182	199	209	227	237

# INDEX, DIFUNCTIONAL COMPOUNDS

Sections—**heavy type**

Pages—**light type**

Blanks in the table  
correspond to sections  
for which additional  
examples were found in  
the literature.

Sections— <b>heavy type</b> Pages— <b>light type</b>											
Alkyne											
300											
238											
Carboxylic acid											
312											
243											
Alcohol, Phenol											
302	313	323									
239	243	247									
Aldehyde											
303	324										
240	253										
Amide											
315	325	334	342								
244	253	278	280								
Amine											
316	326	343	350								
245	255	280	290								
Ester											
317	327	344	351	357							
245	257	281	291	302							
Ether, Epoxide											
307	328	337	345	358	363						
241	260	278	282	303	312						
Halide											
319	329	346	353	359	364	368					
246	264	282	293	304	312	323					
Ketone											
309	320	330	347	354	360	365	369	372			
241	246	266	283	293	305	313	357324	326			
Nitrile											
331	348	355	366	370	373						
272	284	295	350316	325	328						
Alkene											
311	322	332	341	349	356	362	367	371	374	376	377
242	246	273	279	285	296	307	317	326	328	335	337
Oxide											
378	380	382	383	384	385	387	389				
341	341	343	343	344	345	345	347				



# INTRODUCTION

**Relationship between Volume 10 and Previous Volumes.** *Compendium of Organic Synthetic Methods, Volume 10* presents about 1200 examples of published reactions for the preparation of monofunctional compounds, up-dating the 11850 in Volumes 1-9. Volume 10 contains about 550 examples of reactions that prepare difunctional compounds with various functional groups. Reviews have long been a feature of this series, but Volume 10 adds only 13 pertinent reviews in the various sections.

Chapters 1-14 continue as in Volumes 1-9, as does Chapter 15, introduced in Volume 6. Difunctional compounds appear in Chapter 16, as in Volumes 6-9. The sections on oxides as part of difunctional compounds, introduced in volume 7, continues in Chapter 16 of Volumes 8-10 with Sections 378 (Oxides-Alkynes) through Section 390 (Oxides-Oxides).

Following Chapter 16 is a complete alphabetical listing of all authors (last name, initials). The authors for each citation appear below the reaction. The principle author is indicated by underlining (i.e., Kwon, T.W.; Smith, M.B.), as done previously in Volumes 7-9.

**Classification and Organization of Reactions Forming Monofunctional Compounds.** Chemical transformations are classified according to the reacting functional group of the starting material and the functional group formed. Those reactions that give products with the same functional group form a chapter. The reactions in each chapter are further classified into sections on the basis of the functional group of the starting material. Within each section, reactions are loosely arranged in descending order of year cited (1998-1996), although an effort has been made to put similar reactions together when possible. Review articles are collected at the end of each appropriate section.

The classification is unaffected by allylic, vinylic, or acetylenic unsaturation appearing in both starting material and product, or by increases or decreases in the length of carbon chains; for example, the reactions  $t\text{-BuOH} \rightarrow t\text{-BuCOOH}$ ,  $\text{PhCH}_2\text{OH} \rightarrow \text{PhCOOH}$ , and  $\text{PhCH=CHCH}_2\text{OH} \rightarrow \text{PhCH=CHCOOH}$  would all be considered as preparations of carboxylic acids from alcohols. Conjugate reduction and alkylation of unsaturated ketones, aldehydes, esters, acids, and nitriles have been placed in Sections 74D and 74E (Alkyls from Alkenes), respectively.

The terms hydrides, alkyls, and aryls classify compounds containing reacting hydrogens, alkyl groups, and aryl groups, respectively; for example,  $\text{RCH}_2\text{-H} \rightarrow \text{RCH}_2\text{COOH}$  (carboxylic acids from hydrides),  $\text{RMe} \rightarrow \text{RCOOH}$  (carboxylic acids from alkyls),  $\text{RPh} \rightarrow \text{RCOOH}$  (carboxylic acids from aryls). Note the distinction between  $\text{R}_2\text{CO} \rightarrow \text{R}_2\text{CH}_2$  (methylenes from ketones) and  $\text{RCOR}' \rightarrow \text{RH}$  (hydrides from ketones). Alkylations involving additions across double bonds are found in Section 74 (alkyls, methylenes, and aryls from alkenes).

The following examples illustrate the classification of some potentially confusing cases:

$\text{RCH=CHCOOH} \rightarrow$	$\text{RCH=CH}_2$	Hydrides from carboxylic acids
$\text{RCH=CH}_2 \rightarrow$	$\text{RCH=CHCOOH}$	Carboxylic acids from hydrides
$\text{ArH} \rightarrow$	$\text{ArCOOH}$	Carboxylic acids from hydrides
$\text{ArH} \rightarrow$	$\text{ArOAc}$	Esters from hydrides
$\text{RCHO} \rightarrow$	$\text{RH}$	Hydrides from aldehydes
$\text{RCH=CHCHO} \rightarrow$	$\text{RCH=CH}_2$	Hydrides from aldehydes
$\text{RCHO} \rightarrow$	$\text{RCH}_3$	Alkyls from aldehydes
$\text{R}_2\text{CH}_2 \rightarrow$	$\text{R}_2\text{CO}$	Ketones from methylenes
$\text{RCH}_2\text{COR} \rightarrow$	$\text{R}_2\text{CHCOR}$	Ketones from ketones
$\text{RCH=CH}_2 \rightarrow$	$\text{RCH}_2\text{CH}_3$	Alkyls from alkenes (Hydrogenation of Alkenes)
$\text{RBr} + \text{HC}\equiv\text{CH} \rightarrow$	$\text{RC}\equiv\text{CR}$	Acetylenes from halides; also acetylenes from acetylenes
$\text{ROH} + \text{RCOOH} \rightarrow$	$\text{RCOOR}$	Esters from alcohols; also esters from carboxylic acids
$\text{RCH=CHCHO} \rightarrow$	$\text{RCH}_2\text{CH}_2\text{CHO}$	Alkyls from alkenes (Conjugate Reduction)
$\text{RCH=CHCN} \rightarrow$	$\text{RCH}_2\text{CH}_2\text{CN}$	Alkyls from alkenes (Conjugate Reduction)

**How to Use the Book to Locate Examples of the Preparation of Protection of Monofunctional Compounds.** Examples of the preparation of one functional group from another are found in the monofunctional index on p x, which lists the corresponding section and page. Sections that contain examples of the reactions of a functional group are found in the horizontal rows of this index. Section 1 gives examples of the reactions of acetylenes that form new acetylenes; Section 16 gives reactions of acetylenes that form carboxylic acids; and Section 31 gives reactions of acetylenes that form alcohols.

Examples of alkylation, dealkylation, homologation, isomerization, and transposition are found in Sections 1, 17, 33, and so on, lying close to a diagonal of the index. These sections correspond to such topics as the preparation of acetylenes from acetylenes; carboxylic acids from carboxylic acids; and alcohols, thiols, and phenols from alcohols, thiols, and phenols. Alkylations that involve conjugate additions across a double bond are found in Section 74E (Alkyls, Methylenes, and Aryls from Alkenes).

Examples of name reactions can be found by first considering the nature of the starting material and product. The Wittig reaction, for instance, is in Section 199 (Alkenes from Aldehydes) and Section 207 (Alkenes from Ketones). The aldol condensation can be found in the chapters on difunctional compounds in Section 324 (Alcohol, Thiol-Aldehyde) and in Section 330

(Alcohol, Thiol-Ketone). Examples of the synthetically important alkene metathesis reaction are mostly found in Section 209 (Alkenes from Alkenes).

Examples of the protection of acetylenes, carboxylic acids, alcohols, phenols, aldehydes, amides, amines, esters, ketones, and alkenes are also presented. Sections (designated with an A: 15A, 30A, etc.) are labeled "protecting group: reactions" and are located at the end of pertinent chapters.

Some pairs of functional groups such as alcohol, ester; carboxylic acid, ester; amine, amide; and carboxylic acid, amide can be interconverted by simple reactions. When a member of these groups is the desired product or starting material, the other member should also be consulted in the text.

The original literature must be used to determine the generality of reactions, although this is occasionally stated in the citation. This is only done in cases where such generality is stated clearly in the original citation. A reaction given in this book for a primary aliphatic substrate may also be applicable to tertiary or aromatic compounds. This book provides very limited experimental conditions or precautions and the reader is referred to the original literature before attempting a reaction. **In no instance should a citation in this book be taken as a complete experimental procedure. Failure to refer to the original literature prior to beginning laboratory work could be hazardous.** The original papers usually yield a further set of references to previous work. Papers that appear after those publications can usually be found by consulting *Chemical Abstracts and the Science Citation Index*.

**Classification and Organization of Reactions Forming Difunctional Compounds.** This chapter considers all possible difunctional compounds formed from the groups acetylene, carboxylic acid, alcohol, thiol, aldehyde, amide, amine, ester, ether, epoxide, thioether, halide, ketone, nitrile, and alkene. Reactions that form difunctional compounds are classified into sections on the basis of two functional groups in the product that are pertinent to the reaction. The relative positions of the groups do not affect the classification. Thus preparations of 1,2-amino-alcohols, 1,3-amino-alcohols, and 1,4-amino-alcohols are included in a single section (Section 326, Alcohol-Amine). Difunctional compounds that have an oxide as the second group are found in the appropriate section (Sections 278 - 290). The nitroketone product of oxidation of a nitroalcohol is found in Section 386 (Ketone-Oxide). Conversion of an oxide (such as nitro or a sulfone moiety) to another functional group is generally found in the "Miscellaneous" section of the sections concerning monofunctional compounds. Conversion of a nitroalkane to an amine, for example, is found in Section 105 (Amines from Miscellaneous Compounds). The following examples illustrate applications of this classification system:

<i>Difunctional Product</i>	<i>Section Title</i>
$\text{RC}\equiv\text{C}-\text{C}\equiv\text{CR}$	Acetylene-Acetylene
$\text{RCH}(\text{OH})\text{COOH}$	Carboxylic acid-Alcohol
$\text{RCH}=\text{CHOMe}$	Ether-Alkene
$\text{RCHF}_2$	Halide-Halide
$\text{RCH}(\text{Br})\text{CH}_2\text{F}$	Halide-Halide
$\text{RCH}(\text{OAc})\text{CH}_2\text{OH}$	Alcohol-Ester
$\text{RCH}(\text{OH})\text{CO}_2\text{Me}$	Alcohol-Ester
$\text{RCH}=\text{CHCH}_2\text{CO}_2\text{Me}$	Ester-Alkene
$\text{RCH}=\text{CHOAc}$	Ester-Alkene
$\text{RCH}(\text{OMe})\text{CH}_2\text{SO}_2\text{CH}_2\text{CH}_2\text{OH}$	Alcohol-Ether
$\text{RSO}_2\text{CH}_2\text{CH}_2\text{OH}$	Alcohol-Oxide

**How to Use the Book to Locate Examples of the Preparation of Difunctional Compounds.** The difunctional index on p xi gives the section and page corresponding to each difunctional product. Thus Section 327 (Alcohol, Thiol-Ester) contains examples of the preparation of hydroxyesters; Section 323 (Alcohol, Thiol-Alcohol, Thiol) contains examples of the preparation of diols.

Some preparations of alkene and acetylenic compounds from alkene and acetylenic starting materials can, in principle, be classified in either the monofunctional or difunctional sections; for example, the transformation  $\text{RCH}=\text{CHBr} \rightarrow \text{RCH}=\text{CHCOOH}$  could be considered as preparing carboxylic acids from halides (Section 25, monofunctional compounds) or preparing a carboxylic acid-alkene (Section 322, difunctional compounds). The choice usually depends on the focus of the particular paper where this reaction was found. In such cases both sections should be consulted.

Reactions applicable to both aldehyde and ketone starting materials are in many cases illustrated by an example that uses only one of them. Likewise, many citations for reactions found in the Aldehyde-X sections, will include examples that could be placed in the Ketone-X section. Again, the choice is dictated by the paper where the reaction was found.

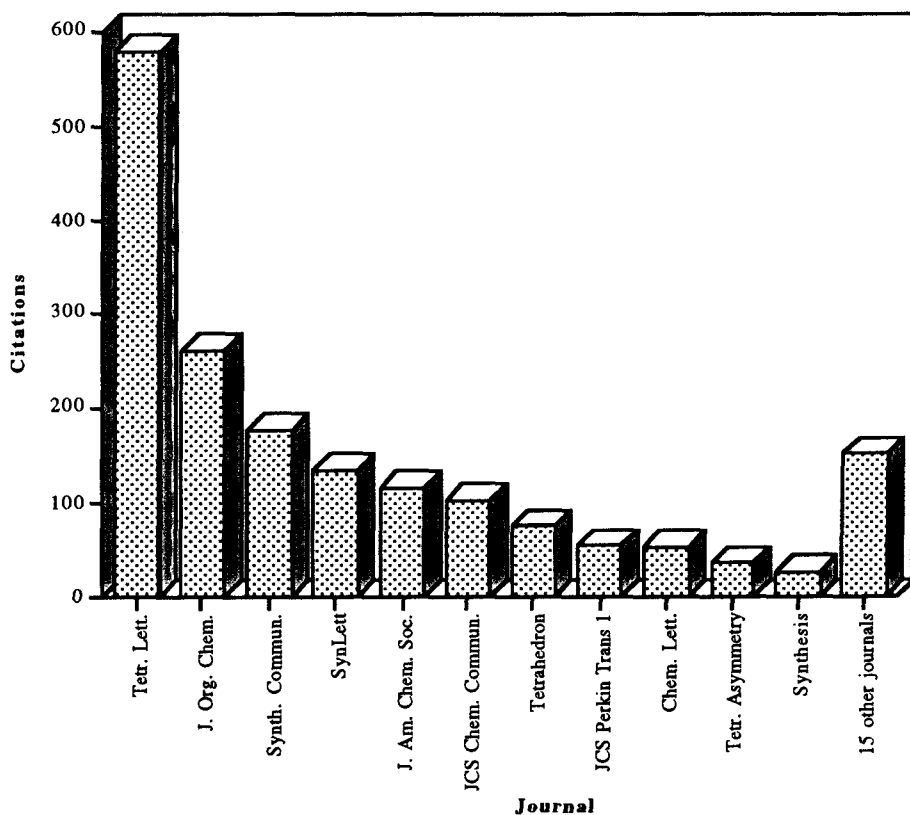
Many literature preparations of difunctional compounds are extensions of the methods applicable to monofunctional compounds. As an example, the reaction  $\text{RCI} \rightarrow \text{ROH}$  might be used for the preparation of diols from an appropriate dichloro compound. Such methods are difficult to categorize and may be found in either the monofunctional or difunctional sections, depending on the focus of the original paper.

The user should bear in mind that the pairs of functional groups alcohol, ester; carboxylic acids, ester; amine, amide; and carboxylic acid, amide can be interconverted by simple reactions. Compounds of the type  $\text{RCH}(\text{OAc})\text{CH}_2\text{OAc}$  (ester-ester) would thus be of interest to anyone preparing the diol  $\text{RCH}(\text{OH})\text{CH}_2\text{OH}$  (alcohol-alcohol).

**Sources of Literature Citations.** I thought it would be useful for a reader of this *Compendium* to see those journals that contain the most new syn-

thetic methodology). The accompanying graph shows that *Tetrahedron Letters* and *Journal of Organic Chemistry* account for roughly 50% of all the citations in Volume 10. This book was not edited to favor one journal, section or type of article over another. Undoubtedly, my own personal preferences are part of the selection, but I believe that this compilation is an accurate representation of new synthetic methods that appear in the literature for this period. Therefore, I believe the accompanying graph reflects those journals where new synthetic methodology is located. I should point out that the category "15 other journals" includes: *Accts. Chem. Res.*; *Acta Chem. Scand.*; *Angew. Chem. Int. Ed. Engl.*; *Bull. Chim. Soc. Fr.*; *Bull. Chim. Soc. Belg.*; *Bull. Chem. Soc. Jpn.*; *J. Chem. Res. (S)*; *Can. J. Chem.*; *Heterocycles*; *J. Heterocyclic Chem.*; *J. Indian Chem. Soc.*; *Liebigs Ann. Chem.*; *Org. Prep. Proceed Int.*; and, *European J. Org. Chem.* In addition, nine more journals were examined but no references were recorded.

### Compendium, Volume 10



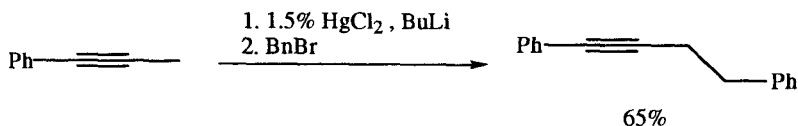
# Compendium of Organic Synthetic Methods

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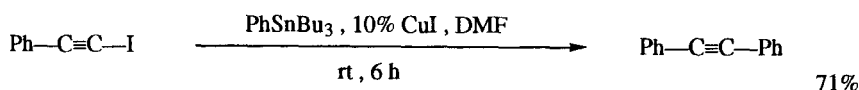
## CHAPTER 1

# PREPARATION OF ALKYNES

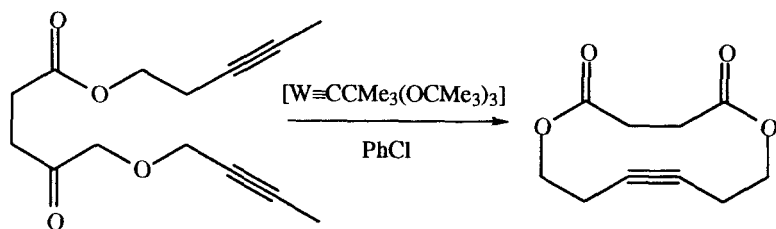
### SECTION 1: ALKYNES FROM ALKYNES



Ma, S.; Wang, L. *J. Org. Chem.*, **1998**, *63*, 3497.

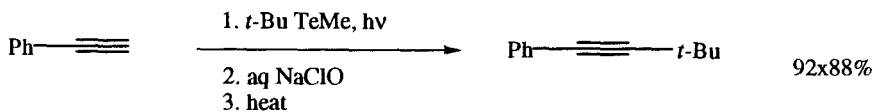


Kang, S.-K.; Kim, W.-Y.; Jiao, X. *Synthesis*, **1998**, 1252.

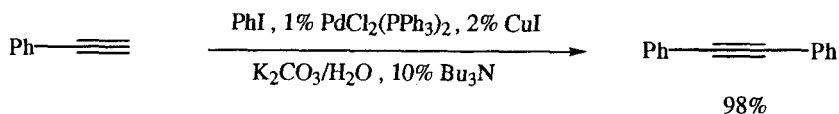


73%

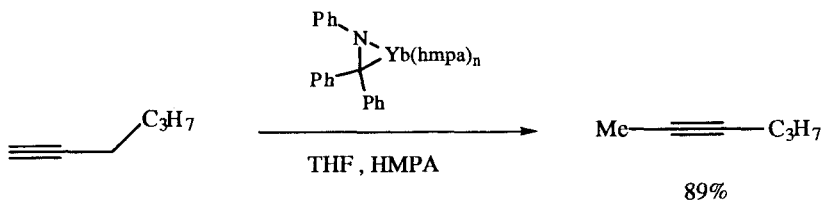
Fürstner, A.; Seidel, G. *Angew. Chem. Int. Ed.*, **1998**, *37*, 1734.



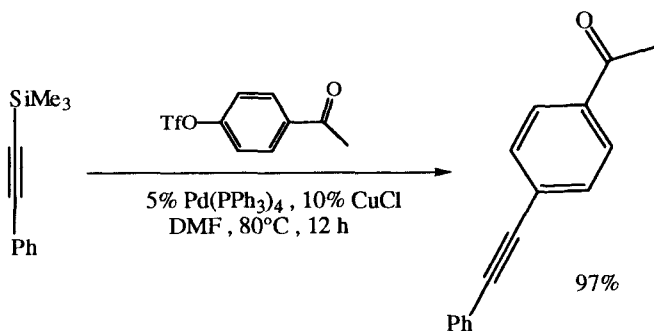
Terao, J.; Kambe, N.; Sonoda, N. *Tetrahedron Lett.*, **1998**, *39*, 5511.



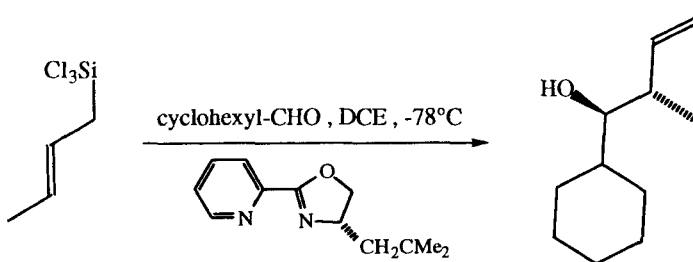
Bumagin, N.A.; Sukhomlinova, L.I.; Luzikova, E.V.; Tolstaya, T.P.; Belestskaya, I.P. *Tetrahedron Lett.*, **1996**, *37*, 897.



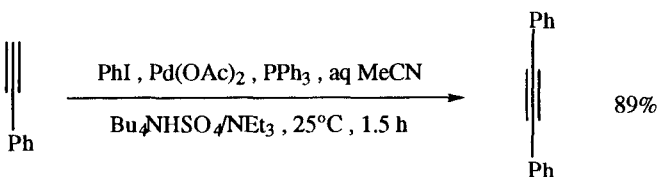
Makioka, Y.; Saiki, A.; Takaki, K.; Taniguchi, Y.; Kitamura, T.; Fujiwara, Y.  
*Chem. Lett.*, **1997**, 27.



Nishihara, Y.; Ikegashira, K.; Mori, A.; Hiyama, T. *Chem. Lett.*, **1997**, 1233.

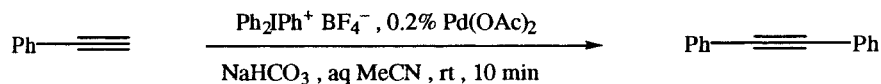


Angell, R.M.; Barrett, A.G.M.; Braddock, D.C.; Swallow, S.; Vickery, B.D.  
*Chem. Commun.*, **1997**, 919.



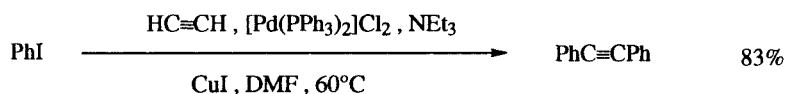
Nguefack, J.-F.; Bolitt, V.; Sinou, D. *Tetrahedron Lett.*, **1996**, 37, 5527.





96%

Kang, S.-K.; Lee, H.-W.; Jang, S.-B.; Ho, P.-S. *Chem. Commun.*, **1996**, 835.



83%

Pal, M.; Kundu, N.G. *J. Chem. Soc., Perkin Trans. 1*, **1996**, 449.

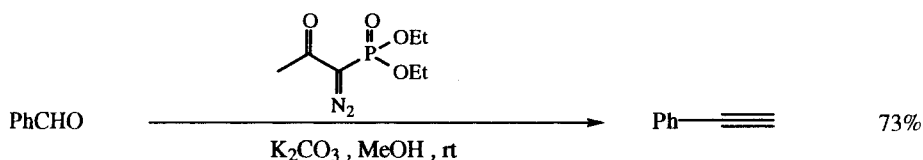
## SECTION 2: ALKYNES FROM ACID DERIVATIVES

NO ADDITIONAL EXAMPLES

## SECTION 3: ALKYNES FROM ALCOHOLS AND THIOLS

NO ADDITIONAL EXAMPLES

## SECTION 4: ALKYNES FROM ALDEHYDES



73%

Müller, S.; Liepold, B.; Roth, G.J.; Bestmann, H.J. *SynLett.*, **1996**, 521.

## SECTION 5: ALKYNES FROM ALKYL, METHYLENES AND ARYL

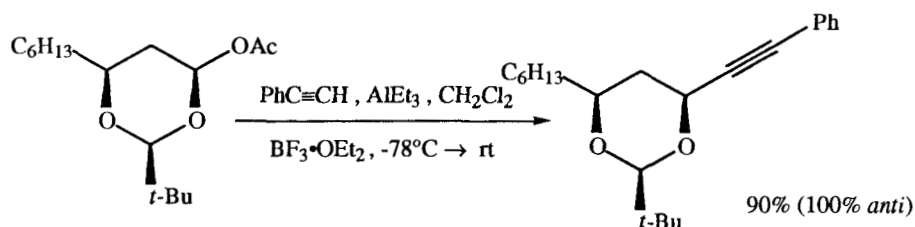
NO ADDITIONAL EXAMPLES

## SECTION 6: ALKYNES FROM AMIDES

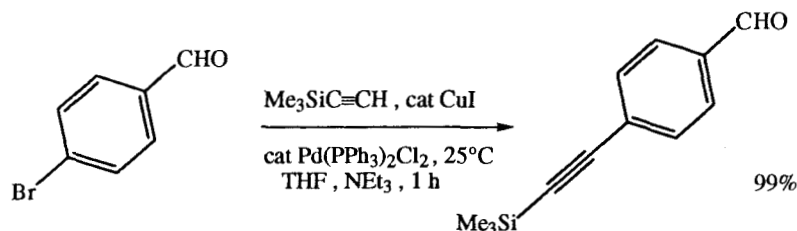
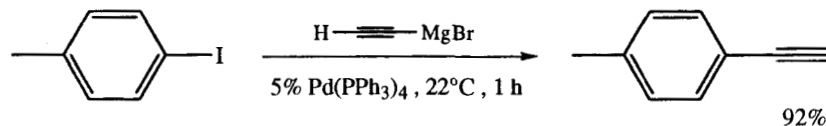
NO ADDITIONAL EXAMPLES

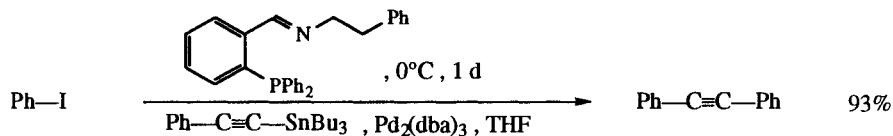
**SECTION 7: ALKYNES FROM AMINES**

NO ADDITIONAL EXAMPLES

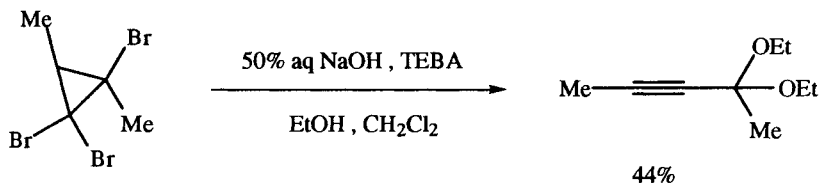
**SECTION 8: ALKYNES FROM ESTERS**Powell, N.A.; Rychnovsky, S.D. *Tetrahedron Lett.*, **1998**, 39, 3103.**SECTION 9: ALKYNES FROM ETHERS, EPOXIDES AND THIOETHERS**

NO ADDITIONAL EXAMPLES

**SECTION 10: ALKYNES FROM HALIDES AND SULFONATES**Thorand, S.; Krause, N. *J. Org. Chem.*, **1998**, 63, 8551.Negishi, E.; Kitora, M.; Xu, C. *J. Org. Chem.*, **1997**, 62, 8957.



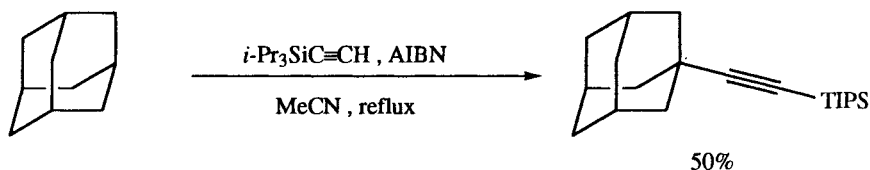
Shirakawa, E.; Yoshida, H.; Takaya, H. *Tetrahedron Lett.*, **1997**, 38, 3759.



Snydes, L.K.; Bakstad, E. *Acta Chem. Scand. B*, **1996**, 50, 446.

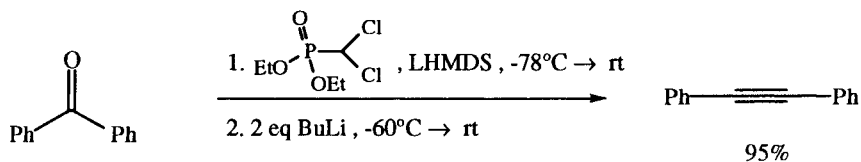
## SECTION 11: ALKYNES FROM HYDRIDES

For examples of the reaction  $RC\equiv CH \rightarrow RC\equiv C-C\equiv CR^1$ , see section 300 (Alkyne-Alkyne).

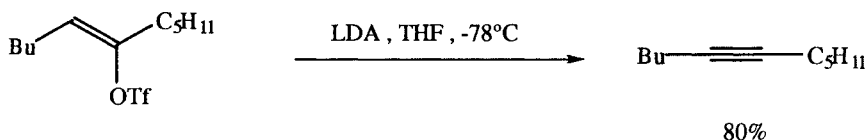


Xiang, J.; Jiang, W.; Fuchs, P.L. *Tetrahedron Lett.*, **1997**, 38, 6635.

## SECTION 12: ALKYNES FROM KETONES



Mouriès, V.; Waschbüsch, R.; Carran, J.; Savignac, P. *Synthesis*, **1998**, 271.



Brummond, K.M.; Gesenberg, K.D.; Kent, J.L.; Kerekes, A.D. *Tetrahedron Lett.*, **1998**, 39, 8613.

**SECTION 13: ALKYNES FROM NITRILES**

NO ADDITIONAL EXAMPLES

**SECTION 14: ALKYNES FROM ALKENES**

NO ADDITIONAL EXAMPLES

**SECTION 15: ALKYNES FROM MISCELLANEOUS COMPOUNDS**

NO ADDITIONAL EXAMPLES

**SECTION 15A: PROTECTION OF ALKYNES**

NO ADDITIONAL EXAMPLES

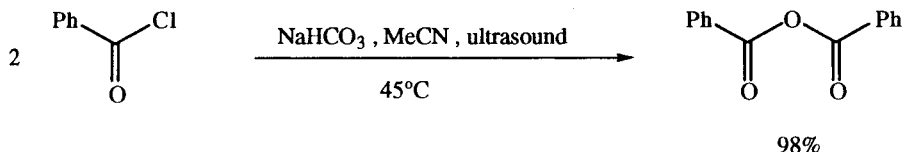
## CHAPTER 2

# PREPARATION OF ACID DERIVATIVES AND ANHYDRIDES

### SECTION 16: ACID DERIVATIVES FROM ALKYNES

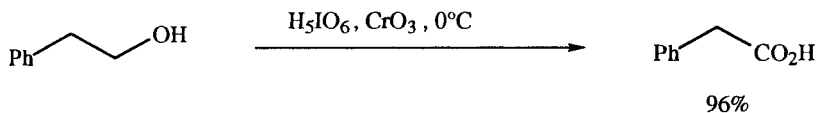
NO ADDITIONAL EXAMPLES

### SECTION 17: ACID DERIVATIVES FROM ACID DERIVATIVES



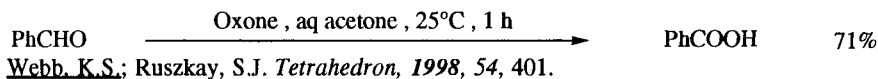
Hu, Y.; Wang, J.-X.; Li, S. *Synth. Commun.*, **1997**, 27, 243.

### SECTION 18: ACID DERIVATIVES FROM ALCOHOLS AND THIOLS

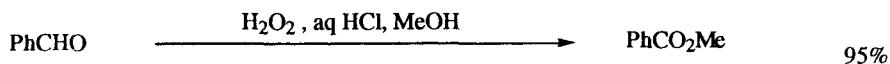


Zhao, M.; Li, J.; Song, Z.; Desmond, R.; Tschaen, D.M.; Grabowski, E.J.J.; Reider, P.J. *Tetrahedron Lett.*, **1998**, 39, 5323.

### SECTION 19: ACID DERIVATIVES FROM ALDEHYDES



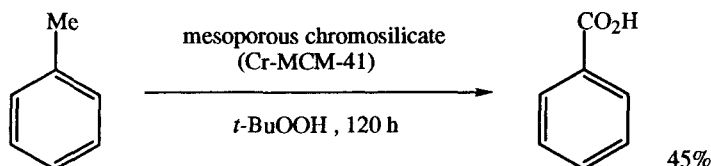
Webb, K.S.; Ruszkay, S.J. *Tetrahedron*, **1998**, 54, 401.



also works with acetals

Takeda, T.; Watanabe, H.; Kitahara, T. *SynLett.*, **1997**, 1149.

## SECTION 20: ACID DERIVATIVES FROM ALKYLs, METHYLENES AND ARYLs



forms ketones from other arenes

Das, T.K.; Chaudhari, K.; Nandan, E.; Chandwadkar, A.J.H.; Sudalai, A.; Ravidranathan, T Sivasanker, S. *Tetrahedron Lett.*, **1997**, 38, 3631.

### REVIEW:

"Exploitation of Synthetic Reactions via C—H Bond Activation by Transition Metal Catalysts. Carboxylation and Aminomethylation of Alkanes or Arenes."

Fujiwara, Y.; Takaki, K.; Tankguchi, Y. *SynLett.*, **1996**, 591.

## SECTION 21: ACID DERIVATIVES FROM AMIDES

NO ADDITIONAL EXAMPLES

## SECTION 22: ACID DERIVATIVES FROM AMINES

NO ADDITIONAL EXAMPLES

## SECTION 23: ACID DERIVATIVES FROM ESTERS

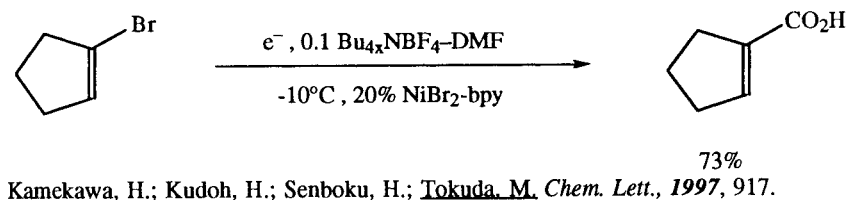
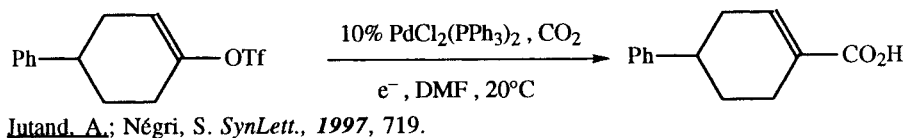
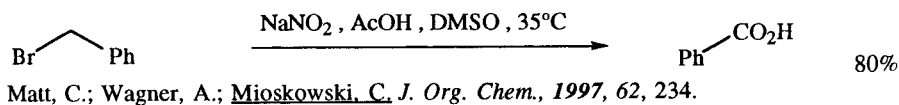
NO ADDITIONAL EXAMPLES

Other reactions useful for the hydrolysis of esters may be found in Section 30A (Protection of Carboxylic Acids).

## SECTION 24: ACID DERIVATIVES FROM ETHERS, EPOXIDES AND THIOETHERS

NO ADDITIONAL EXAMPLES

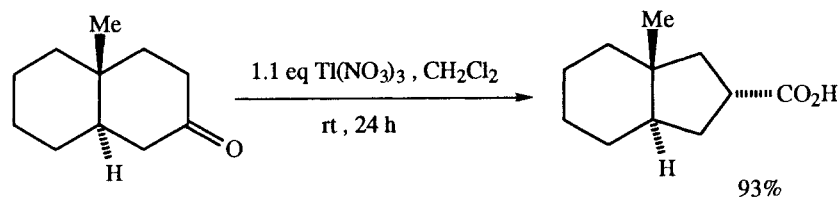
## SECTION 25: ACID DERIVATIVES FROM HALIDES AND SULFONATES

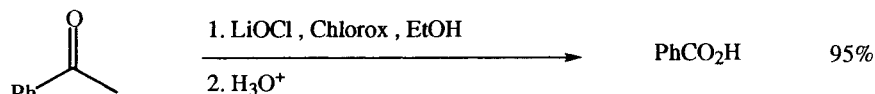


## SECTION 26: ACID DERIVATIVES FROM HYDRIDES

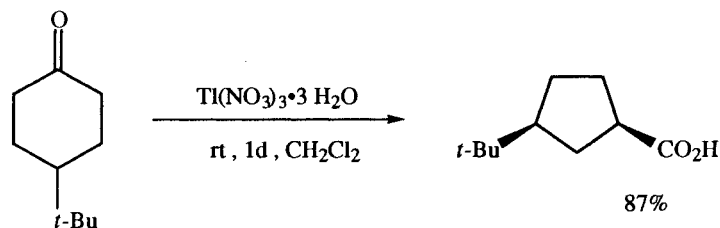
NO ADDITIONAL EXAMPLES

## SECTION 27: ACID DERIVATIVES FROM KETONES





Madler, M.M.; Klucik, J.; Soell, P.S.; Brown, C.W.; Liu, S.; Berlin, K.D.; Benbrook, D.M.; Birckbichler, P.J.; Nelson, E.C. *Org. Prep. Proceed. Int.*, **1998**, 30, 230.

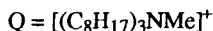
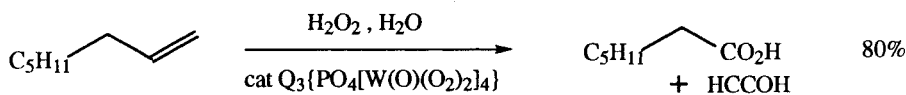


Ferraz, H.M.C.; Silva Jr., L.F. *Tetrahedron Lett.*, **1997**, 38, 1899.

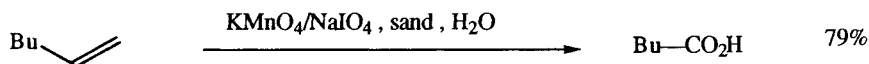
## SECTION 28: ACID DERIVATIVES FROM NITRILES

NO ADDITIONAL EXAMPLES

## SECTION 29: ACID DERIVATIVES FROM ALKENES



Antonelli, E.; D'Aloisio, R.; Gambaro, M.; Fiorani, T.; Venturello, C.  
*J. Org. Chem.*, **1998**, 63, 7190.



Juang, B.; Gupton, J.T.; Hansen, K.C.; Idoux, J.P. *Synth. Commun.*, **1996**, 26, 165.

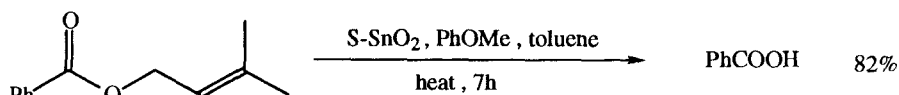
## SECTION 30: ACID DERIVATIVES FROM MISCELLANEOUS COMPOUNDS

NO ADDITIONAL EXAMPLES

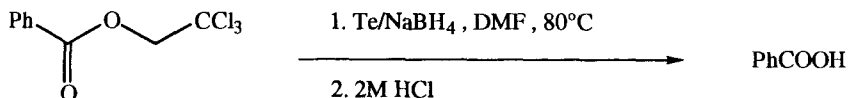


**SECTION 30A: PROTECTION OF CARBOXYLIC ACID DERIVATIVES**

Other reactions useful for the protection of carboxylic acids are included in Section 107 (Esters from Carboxylic Acids and Acid Halides) and Section 23 (Carboxylic Acids from Esters).



Chavan, S.P.; Zubaidha, P.K.; Dantale, S.W.; Keshavaraja, A.; Ramaswamy, A.V.; Ravindranathan, T. *Tetrahedron Lett.*, **1996**, 37, 237.



Blay, G.; Cardona, L.; García, B.; García, C.L.; Pedro, J.R. *Synth. Commun.*, **1998**, 28, 1405

## CHAPTER 3

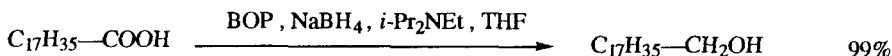
### PREPARATION OF ALCOHOLS

NO ADDITIONAL EXAMPLES

#### SECTION 31: ALCOHOLS AND THIOLS FROM ALKYNES

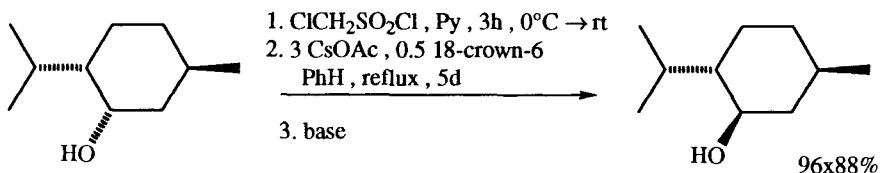
NO ADDITIONAL EXAMPLES

#### SECTION 32: ALCOHOLS AND THIOLS FROM ACID DERIVATIVES

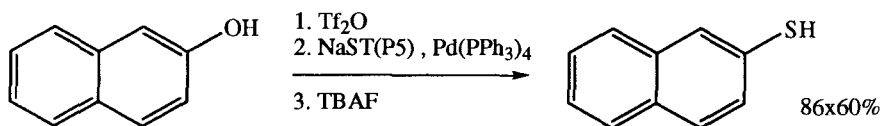


BOP = benzotriazol-1-yloxytris(dimethylamino)phosphonium hexafluorophosphate  
McGeary, R.P. *Tetrahedron Lett.*, **1998**, 39, 3319.

#### SECTION 33: ALCOHOLS AND THIOLS FROM ALCOHOL AND THIOLS



Shimizu, T.; Hiranuma, S.; Nakata, T. *Tetrahedron Lett.*, **1996**, 37, 6145.



Arnould, J.C.; Didelot, M.; Cadilhac, C.; Pasquet, M.J. *Tetrahedron Lett.*, **1996**, 37, 4523.

## SECTION 34: ALCOHOLS AND THIOLS FROM ALDEHYDES

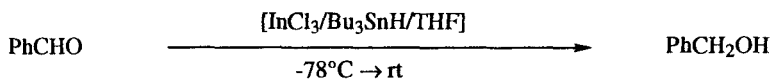
The following reaction types are included in this section:

A. Reductions of Aldehydes to Alcohols

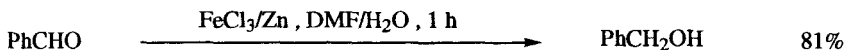
B. Alkylation of Aldehydes, forming Alcohols.

Coupling of Aldehydes to form Diols is found in Section 323 (Alcohol-Alcohol).

### SECTION 34A: REDUCTIONS OF ALDEHYDES TO ALCOHOLS

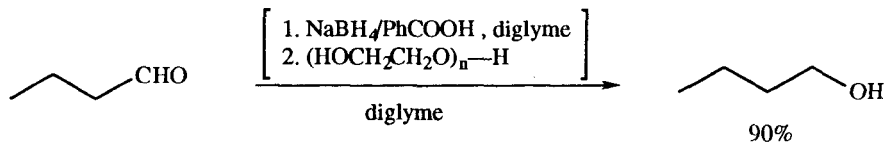


Miyai, T.; Inoue, K.; Yasuda, M.; Shibata, I.; Baba, A. *Tetrahedron Lett.*, **1998**, 39, 1929.



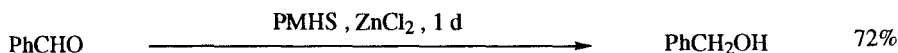
also reduces ketones

Sadavaarte, V.S.; Swami, S.S.; Desai, D.G. *Synth. Commun.*, **1998**, 28, 1139.



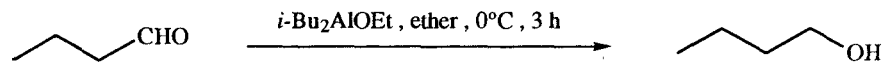
these conditions are selective for aldehydes

Blanton, J.R. *Synth. Commun.*, **1997**, 27, 2093.

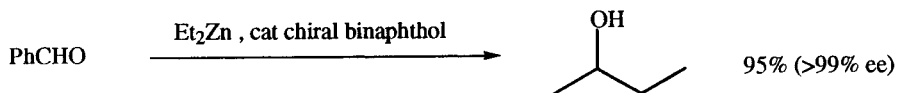


PMHS = polymethylhydrosiloxane

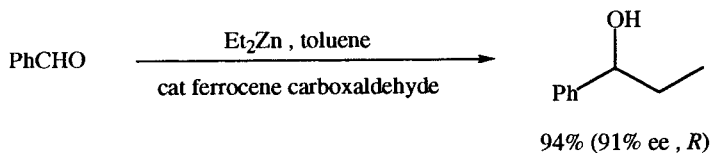
Chandrasekhar, S.; Reddy, Y.R.; Tamarao, C. *Synth. Commun.*, **1997**, 27, 2251.



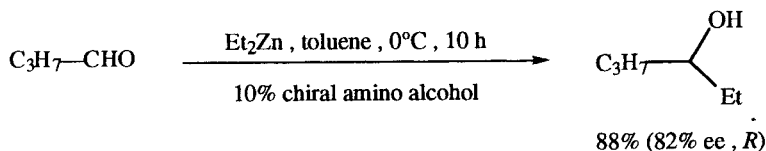
Cha, J.S.; Kwon, O.O.; Kwon, S.Y. *Org. Prep. Proceed. Int.*, **1996**, 28, 355.

**SECTION 34B: ALKYLATION OF ALDEHYDES, FORMING ALCOHOLS****ASYMMETRIC ALKYLATIONS**

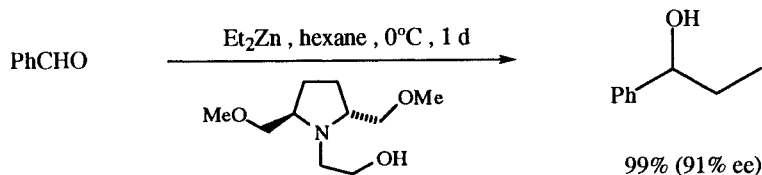
Huang, W.-S.; Hu, Q.-S.; Pu, L. *J. Org. Chem.*, **1998**, 63, 1364.



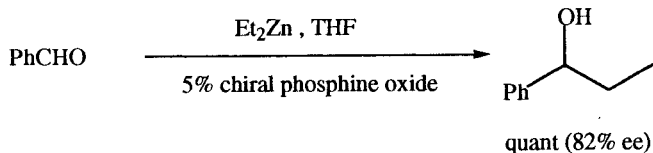
Fukuzawa, S.-i.; Kato, H. *SynLett.*, **1998**, 727.



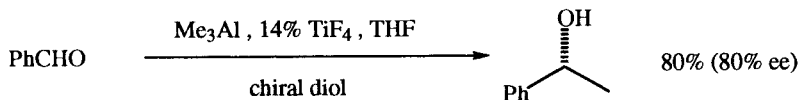
Cho, B.T.; Chun, Y.S. *Tetrahedron Asymmetry*, **1998**, 9, 1489.



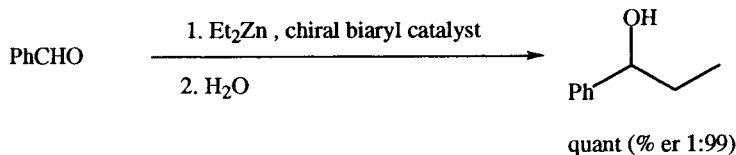
Shi, M.; Satoh, Y.; Masaki, Y. *J. Chem. Soc., Perkin Trans. 1*, **1998**, 2547.



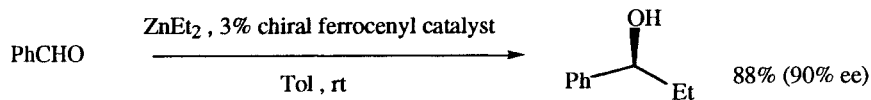
Legrand, O.; Brunel, J.-M.; Buono, G. *Tetrahedron Lett.*, **1998**, 39, 9419.



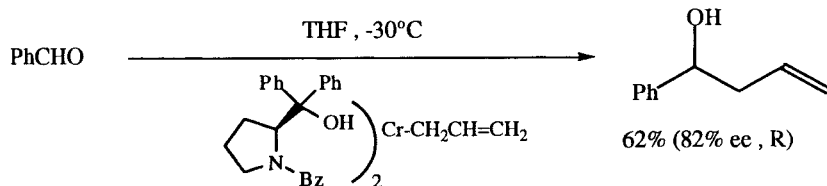
Pagenkopf, B.L.; Carreira, E.M. *Tetrahedron Lett.*, **1998**, 39, 9593.



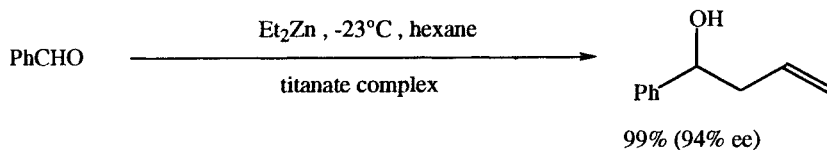
Bringmann, G.; Breuning, M. *Tetrahedron Asymmetry*, **1998**, 9, 667.



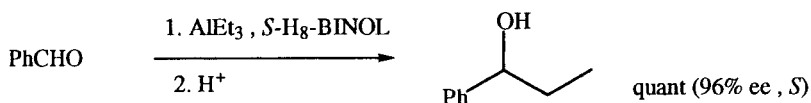
Dosa, P.I.; Ruble, J.C.; Fu, G.C. *J. Org. Chem.*, **1997**, 62, 444.



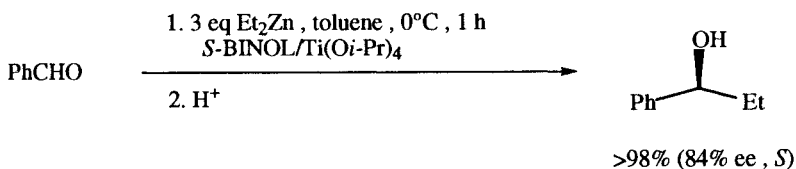
Sugimoto, K.; Aoyagi, S.; Kibayashi, C. *J. Org. Chem.*, **1997**, 62, 2322.



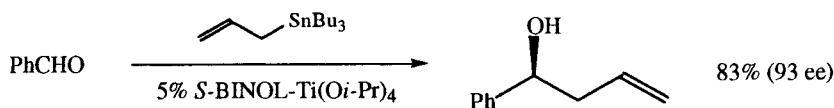
Qiu, J.; Guo, C.; Zhang, X. *J. Org. Chem.*, **1997**, 62, 2665.



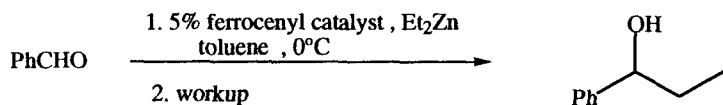
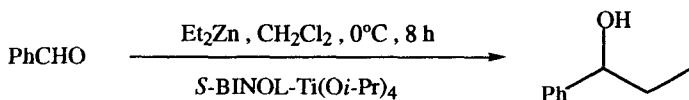
Chan, A.S.C.; Zhang, F.-y.; Yip, C.-W. *J. Am. Chem. Soc.*, **1997**, 119, 4080.



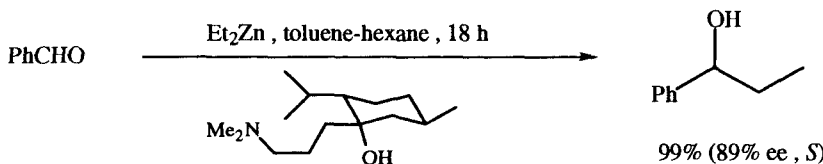
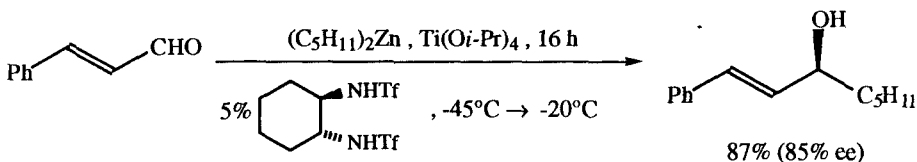
Mori, M.; Nakai, T. *Tetrahedron Lett.*, **1997**, 38, 6233.



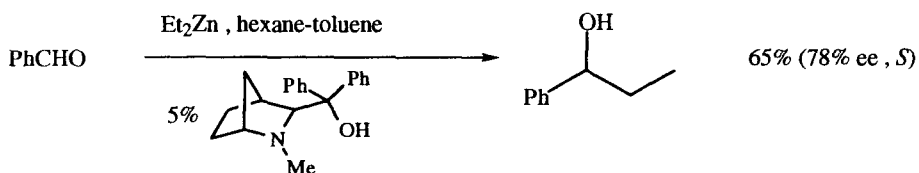
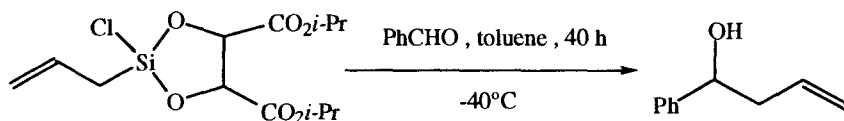
Yu, C.-M.; Cho, H.-S.; Yoon, S.-K.; Jung, W.-H. *SynLett.*, **1997**, 889.

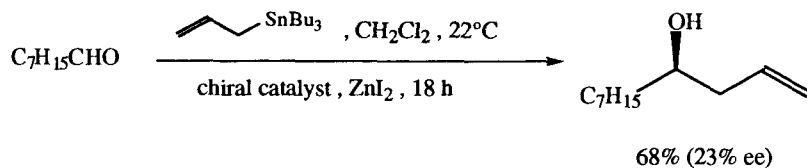
83% (93% ee, *R*)Bolm, C.; Fernández, K.M.; Seger, A.; Raabe, G. *SynLett.*, **1997**, 1051.

quant (91.9% ee)

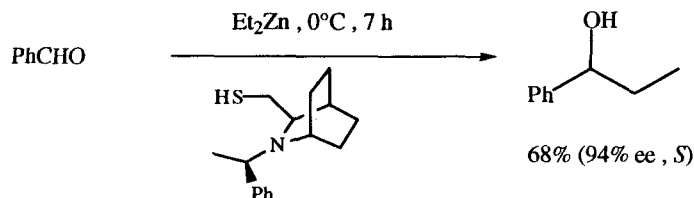
Zhang, F.-Y.; Yip, C.-W.; Cao, R.; Chan, A.S.C. *Tetrahedron Asymmetry*, **1997**, 8, 585.99% (89% ee, *S*)Genov, M.; Dimitrov, V.; Ivanova, V. *Tetrahedron Asymmetry*, **1997**, 8, 3703.

87% (85% ee)

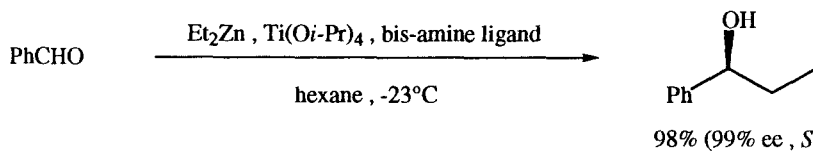
Vettel, S.; Lutz, C.; Diefenbach, A.; Haderlein, G.; Hammerschmidt, S.; Kühling, K.; Mofid, M.-R.; Zimmerman, T.; Knochel, P. *Tetrahedron Asymmetry*, **1997**, 8, 779.65% (78% ee, *S*)Nakano, H.; Kumagai, N.; Matsuzaki, H.; Kubato, C.; Hongo, H. *Tetrahedron Asymmetry*, **1997**, 8, 1391.73% (60% ee, *S*)Zhang, L.C.; Sakurai, H.; Kira, M. *Chem. Lett.*, **1997**, 129.



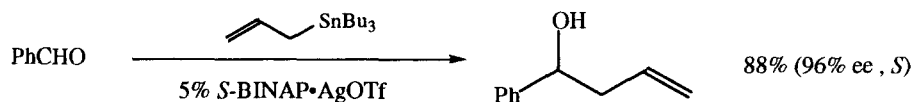
Coi, P.G.; Orioli, P.; Tagliavini, E.; Umani-Ronchi, A. *Tetrahedron Lett.*, **1997**, 38, 145.



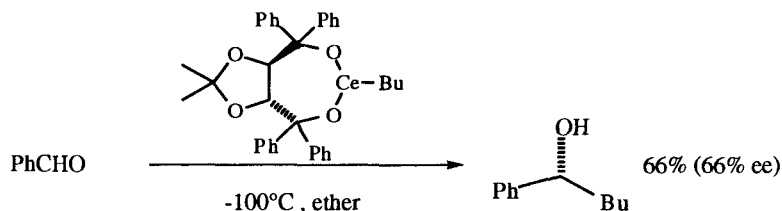
Nakano, H.; Iwasa, K.; Hongo, H. *Heterocycles*, **1997**, 46, 267.



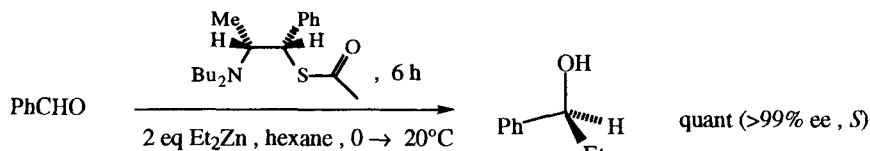
Guo, C.; Qiu, J.; Zhang, X.; Verdugo, D.; Larter, M.L.; Christie, R.; Kenney, P.; Walsh, P.J. *Tetrahedron*, **1997**, 53, 4145.



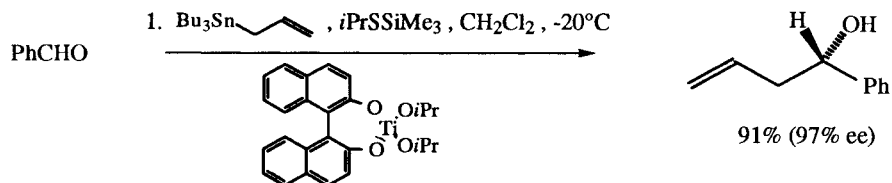
Yanagisawa, A.; Nakashima, H.; Ishiba, A.; Yamamoto, H. *J. Am. Chem. Soc.*, **1996**, 118, 4723.



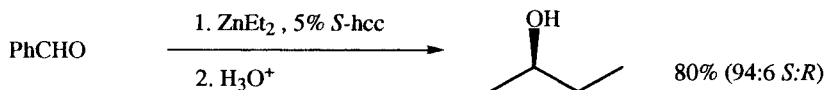
Greeves, N.; Pease, J.E.; Bowden, M.C.; Brown, S.M. *Tetrahedron Lett.*, **1996**, 37, 2675.



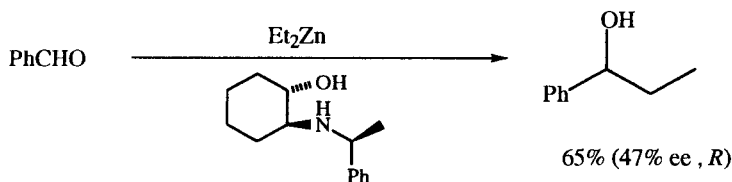
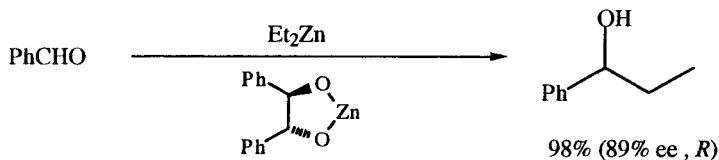
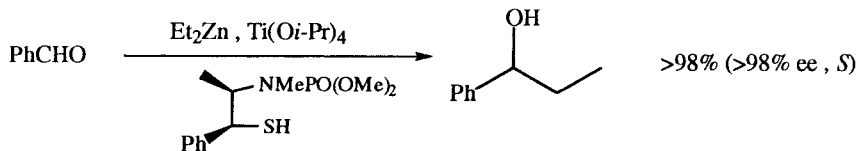
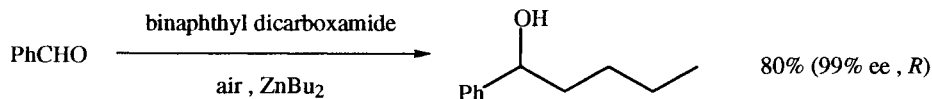
Jin, M.-L.; Ahn, S.-J.; Lee, K.-S. *Tetrahedron Lett.*, **1996**, 37, 8767.



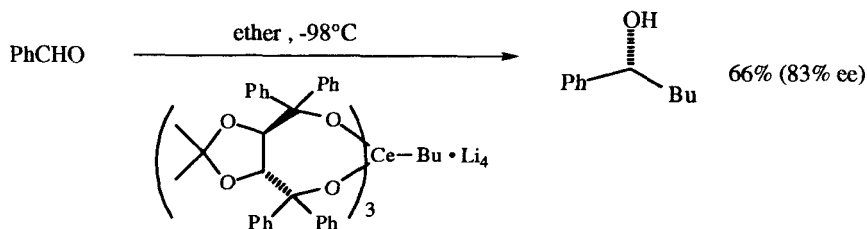
2. TBAF

Yu, C.-M.; Choi, H.-S.; Jung, W.-H.; Lee, S.S. *Tetrahedron Lett.*, **1996**, 37, 7095.

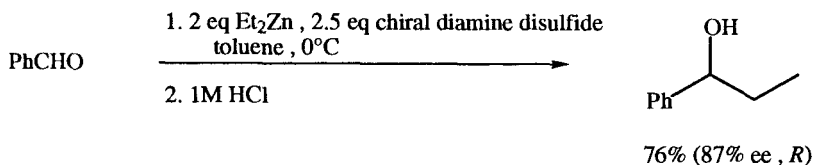
hcc = hyperbranched chiral catalysts

Bolm, C.; Derrien, N.; Seger, A. *SynLett.*, **1996**, 387.de Parrodi, C.A.; Juaristi, E.; Quintero-Cortés, L.; Amador, P. *Tetrahedron Asymmetry*, **1996**, 7, 1915.Prasad, K.R.K.; Joshi, N.N. *Tetrahedron Asymmetry*, **1996**, 7, 1957.Hulst, R.; Heres, H.; Fitzpatrick, K.; Pepper, N.C.M.W.; Kellogg, R.M. *Tetrahedron Asymmetry*, **1996**, 7, 2755.Kitajima, H.; Ito, K.; Katsuki, T. *Chem. Lett.*, **1996**, 343.

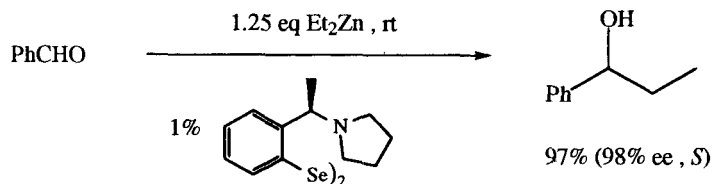




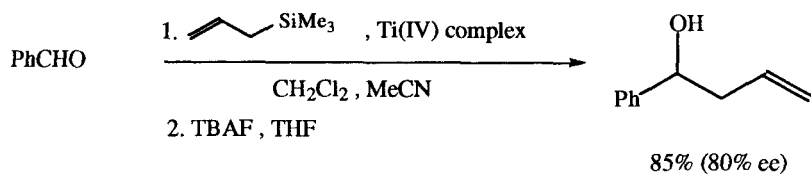
Greeves, N.; Pease, J.E. *Tetrahedron Lett.*, **1996**, 37, 5821.



Bibson, C.L. *Chem. Commun.*, **1996**, 645.

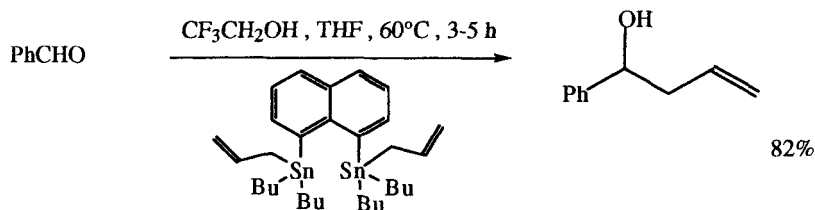


Wirth, T.; Kulicke, K.J.; Fragale, G. *Helv. Chim. Acta*, **1996**, 79, 1957.

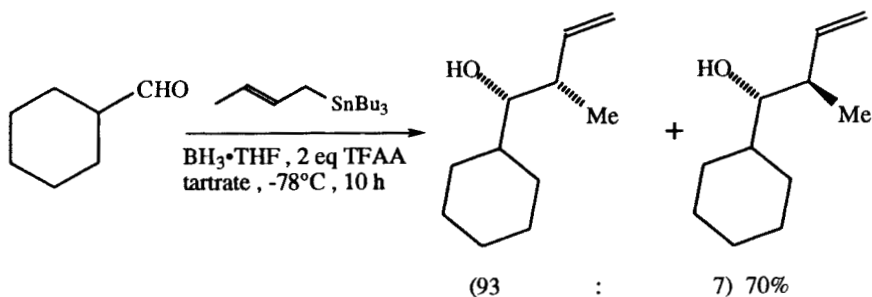


Gauthier Jr., D.R.; Carreira, E.M. *Angew. Chem. Int. Ed.*, **1996**, 35, 2363.

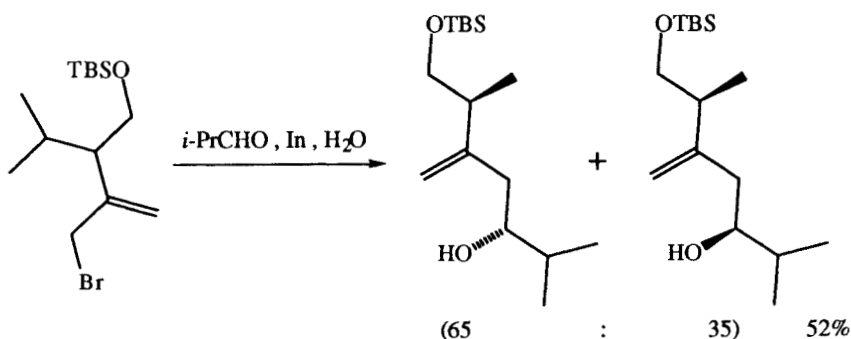
## NON-ASYMMETRIC ALKYLATIONS



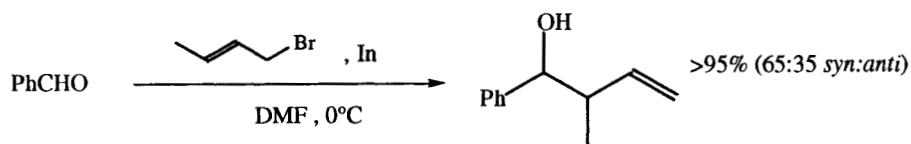
Asao, N.; Abe, N.; Tan, Z.; Maruoka, K. *SynLett.*, **1998**, 377.



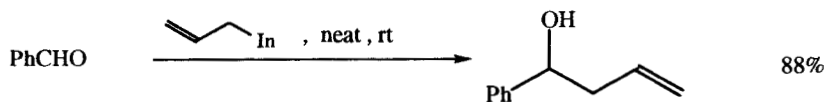
Marshall, J.A.; Palovich, M.R. *J. Org. Chem.*, **1998**, 63, 4381.



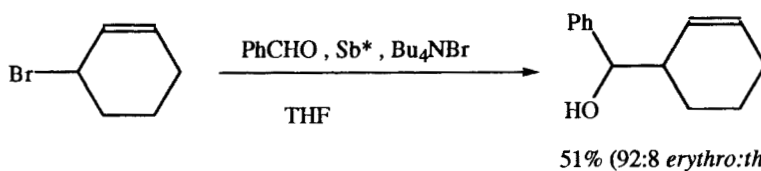
Paquette, L.A.; Bennett, G.D.; Isaac, M.B.; Chhatriwalla, A. *J. Org. Chem.*, **1998**, 63, 1836



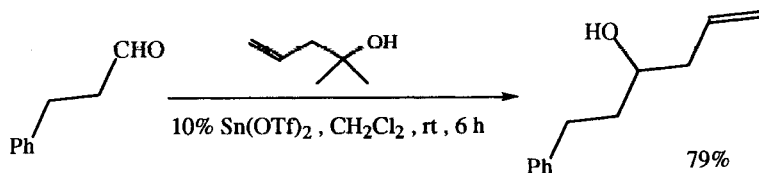
Lloyd-Jones, G.C.; Russell, T. *SynLett.*, **1998**, 903.



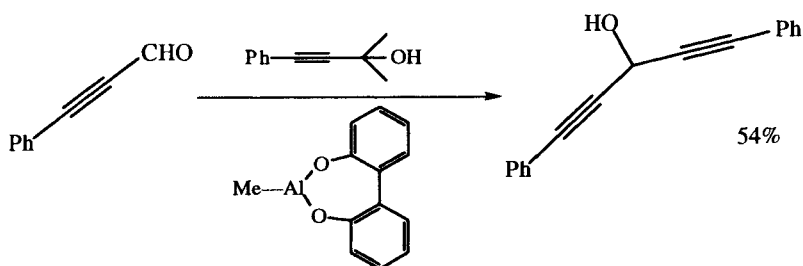
Yi, X.-H.; Haberman, J.X.; Li, C.-L. *Synth. Commun.*, **1998**, 28, 2999.



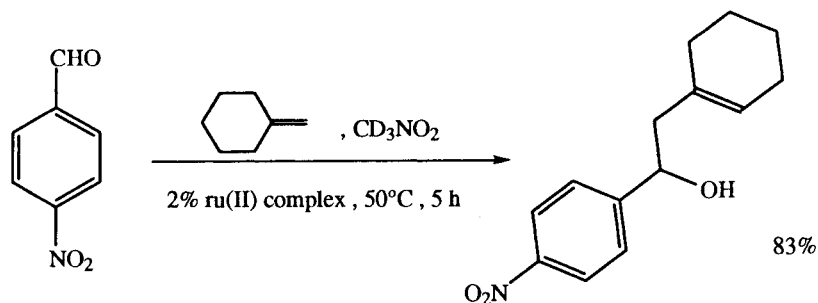
Jim, Q.-H.; Ren, P.-D.; Li, Y.-Q.; Yao, Z.-P. *Synth. Commun.*, **1998**, 28, 4151.



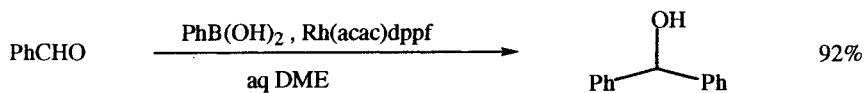
Nokami, J.; Yoshizane, K.; Matsuura, H.; Sumida, S.-i. *J. Am. Chem. Soc.*, **1998**, *120*, 6609



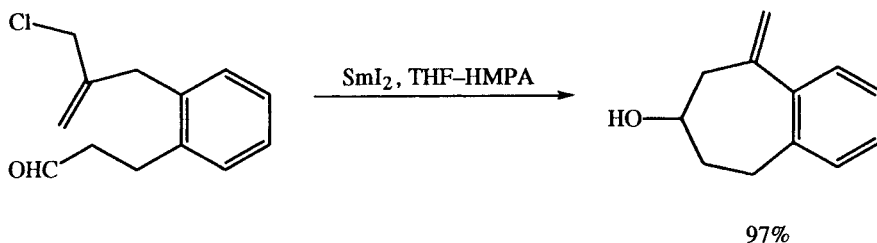
Ooi, T.; Miura, T.; Maruoka, K. *J. Am. Chem. Soc.*, **1998**, *120*, 10790.



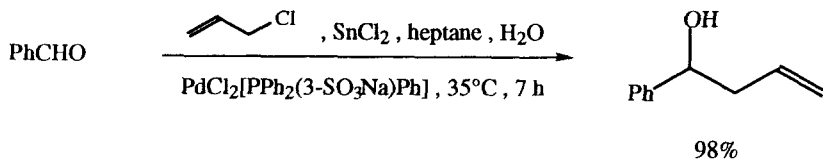
Ellis, W.W.; Odenkirk, W.; Bosnich, B. *Chem. Commun.*, **1998**, 1311.



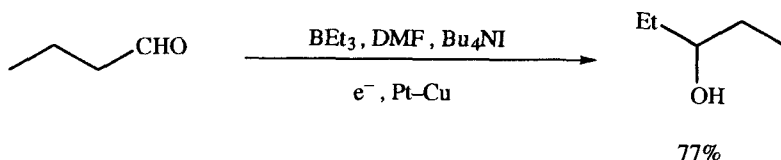
Sakai, M.; Ueda, M.; Miyaura, N. *Angew. Chem. Int. Ed.*, **1998**, *37*, 3279.



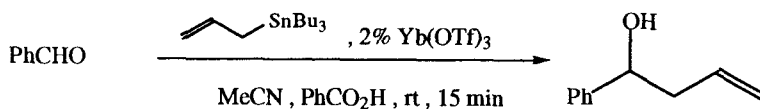
Matsuda, F.; Sakai, T.; Okada, N.; Miyashita, M. *Tetrahedron Lett.*, **1998**, *39*, 863



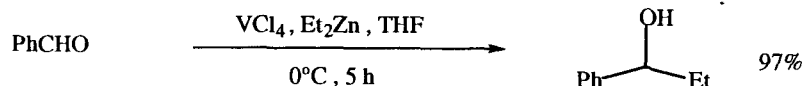
Okano, T.; Kiji, J.; Doi, T. *Chem. Lett.*, **1998**, 5.



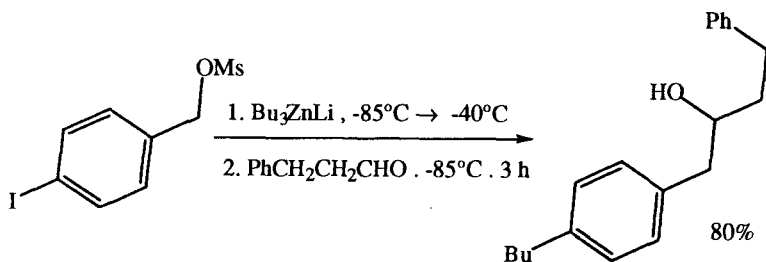
Choi, J.H.; Youm, J.S.; Cho, C.-G.; Czae, M.-Z.; Hwang, B.K.; Kim, J.S. *Tetrahedron Lett.*, **1998**, 39, 4835.



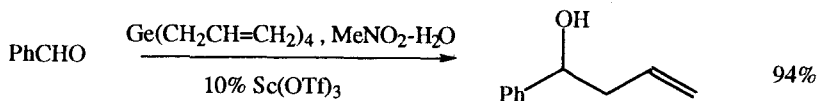
Aspinall, H.C.; Greeves, N.; McIver, E.G. *Tetrahedron Lett.*, **1998**, 39, 9283.



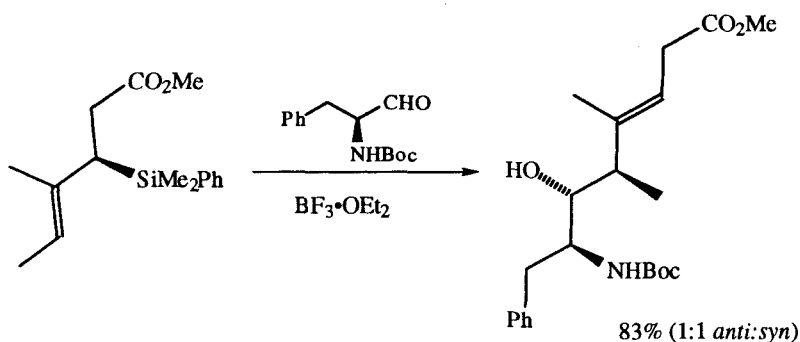
Kataoka, Y.; Makihira, I.; Utsunomiya, M.; Tani, K. *J. Org. Chem.*, **1997**, 62, 8540.



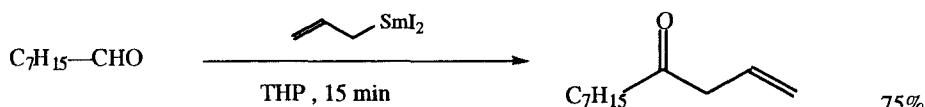
Harada, T.; Kaneko, T.; Fujiwara, R.; Oku, A. *J. Org. Chem.*, **1997**, 62, 8966.



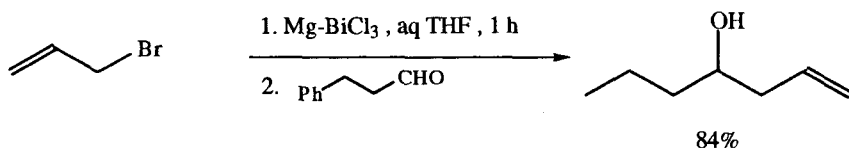
Akiyama, T.; Iwai, J. *Tetrahedron Lett.*, **1997**, 38, 853.



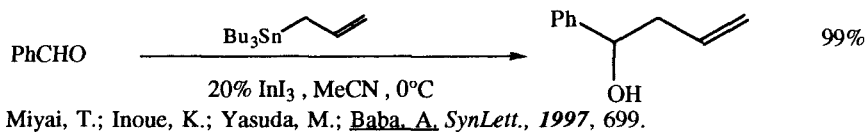
Panek, J.S.; Liu, P. *Tetrahedron Lett.*, **1997**, 38, 5127.



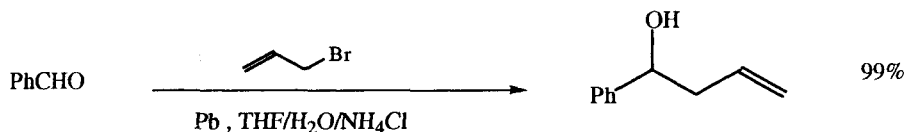
Hamann-Gaudinet, B.; Namy, J.-L.; Kagan, H.B. *Tetrahedron Lett.*, **1997**, 38, 6585.



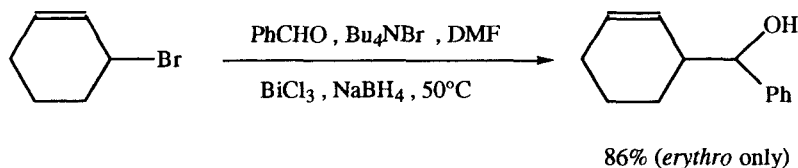
Wada, M.; Fukuma, T.; Morioka, M.; Takahashi, T.; Miyoshi, N. *Tetrahedron Lett.*, **1997**, 38, 8045.



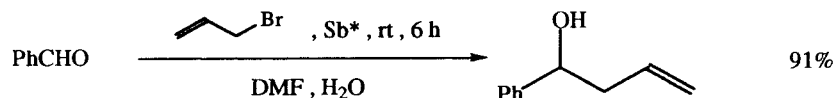
Miyai, T.; Inoue, K.; Yasuda, M.; Baba, A. *SynLett.*, **1997**, 699.



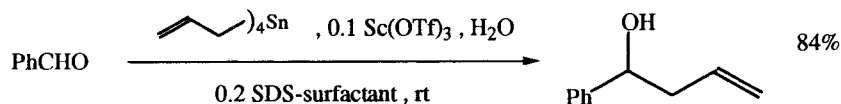
Zhou, J.-Y.; Jia, Y.; Sung, G.-F.; Wu, S.-H. *Synth. Commun.*, **1997**, 27, 1899.



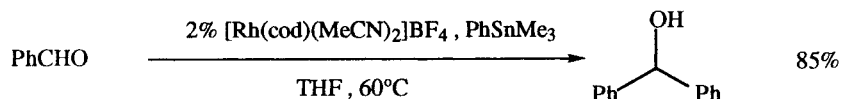
Ren, P.-D.; Shao, D.; Dong, T.-W. *Synth. Commun.*, **1997**, 27, 2569.



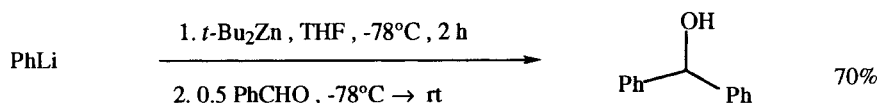
Ren, P.-D.; Jin, Q.-H.; Yao, Z.P. *Synth. Commun.*, **1997**, 27, 2761.



Kobayashi, S.; Wakabayashi, T.; Oyamada, H. *Chem. Lett.*, **1997**, 831.

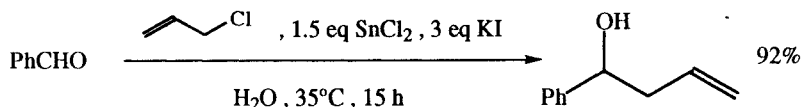


Oi, S.; Moro, M.; Inoue, Y. *Chem. Commun.*, **1997**, 1621.

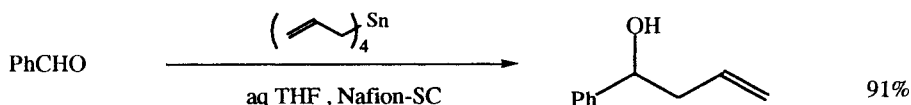


Kondo, Y.; Fujinami, M.; Uchiyama, M.; Sakamoto, T.

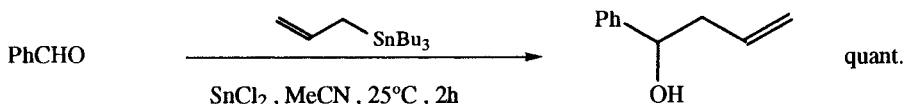
*J. Chem. Soc., Perkin Trans. 1*, **1997**, 799.



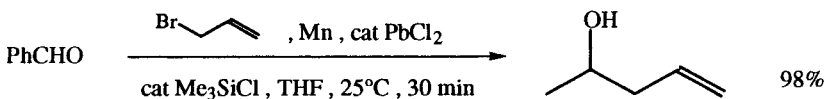
Houllemare, D.; Outurquin, F.; Paulmier, C. *J. Chem. Soc., Perkin Trans. 1*, **1997**, 1629.



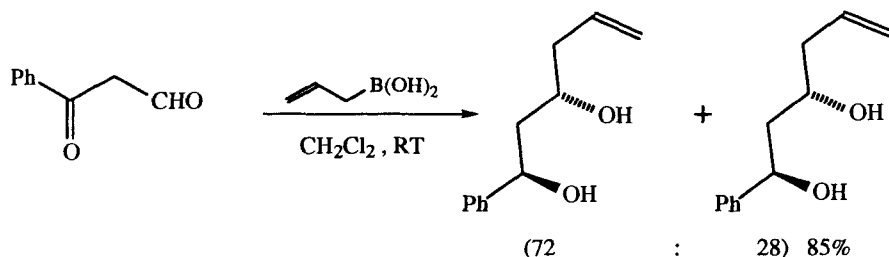
Kobayashi, S.; Nagayama, S. *J. Org. Chem.*, **1996**, 61, 2256.



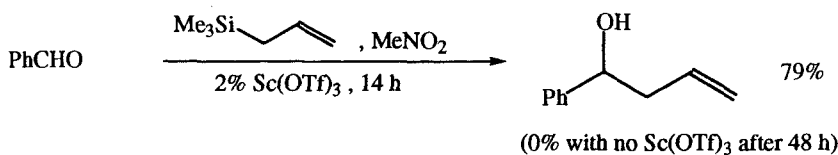
Riguet, E.; Klement, I.; Reddy, Ch.K.; Cahiez, G.; Knochel, P. *Tetrahedron Lett.*, **1996**, 37, 5865.



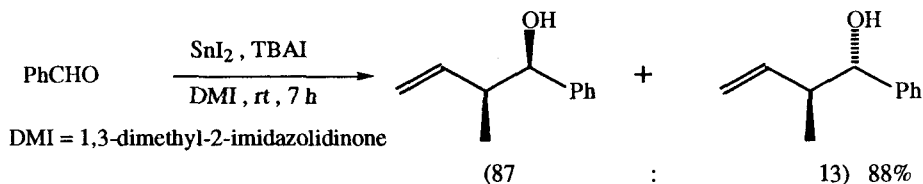
Takai, K.; Ueda, T.; Hayashi, T.; Moriwake, T. *Tetrahedron Lett.*, **1996**, 37, 7049.



Kabalka, G.W.; Narayana, C.; Reddy, N.K. *Tetrahedron Lett.*, **1996**, 37, 2181.

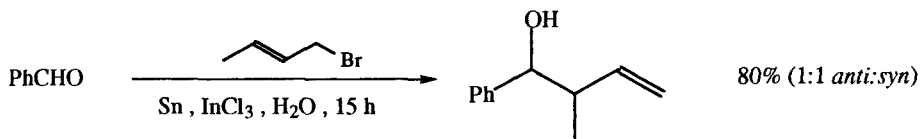


Aggarwal, V.K.; Vennall, G.P. *Tetrahedron Lett.*, **1996**, 37, 3745.

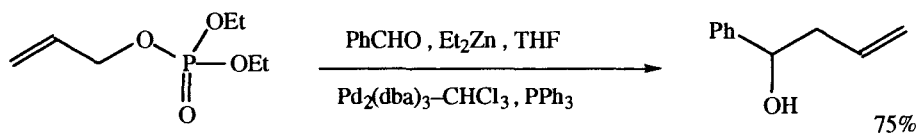


DMI = 1,3-dimethyl-2-imidazolidinone

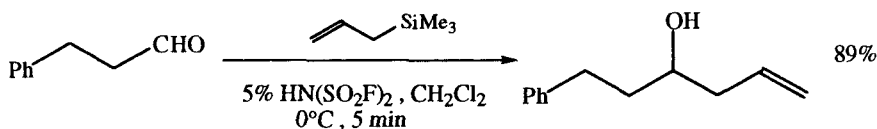
Masuyama, Y.; Kishida, M.; Kurusu, Y. *Tetrahedron Lett.*, **1996**, 37, 7103.



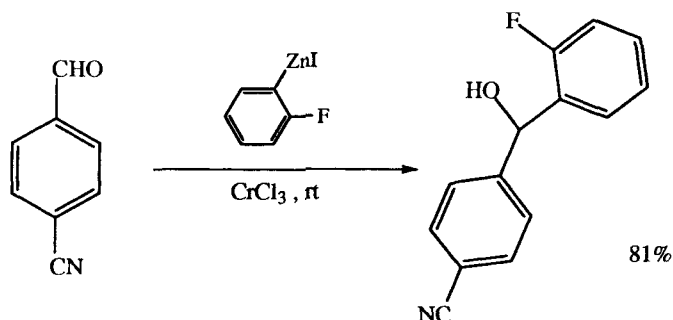
Li, X.-R.; Loh, T.-P. *Tetrahedron Asymmetry*, **1996**, 7, 1535.



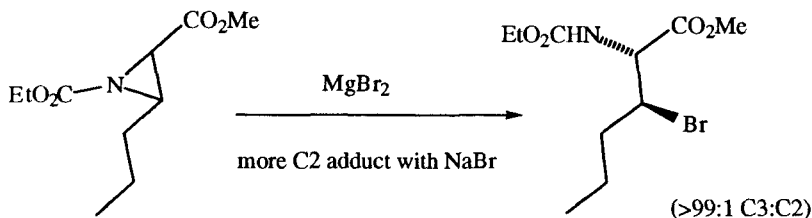
Kang, S.-K.; Kim, D.-Y.; Hong, R.-K.; Ho, P.-S. *Synth. Commun.*, **1996**, 26, 1493.



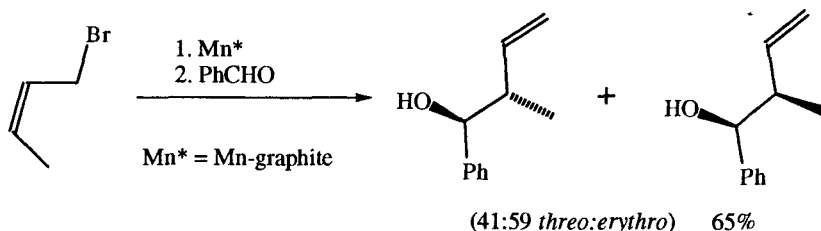
Kaur, G.; Manju, K.; Trehan, S. *Chem. Commun.*, **1996**, 581.



Ogawa, Y.; Mori, M.; Saiga, A.; Takagi, K. *Chem. Lett.*, **1996**, 1069.



Righi, G.; D'Achille, R.; Bonini, C. *Tetrahedron Lett.*, **1996**, 37, 6893.

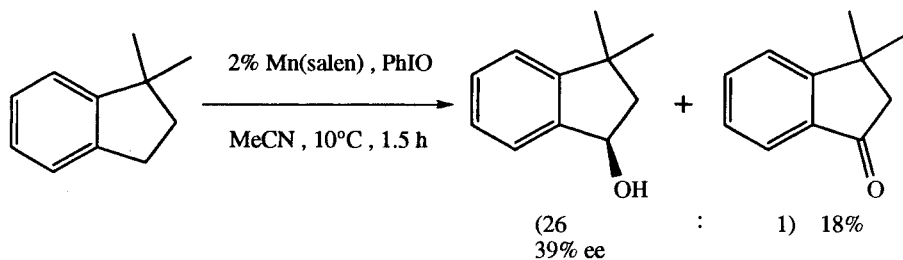


Furstner, A.; Brunner, H. *Tetrahedron Lett.*, **1996**, 37, 7009.

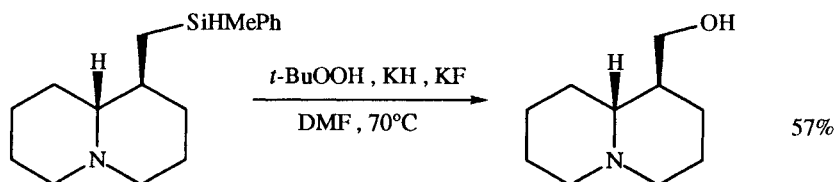
## SECTION 35: ALCOHOLS AND THIOLS FROM ALKYL, METHYLENES AND ARYLS

No examples of the reaction  $\text{RR}^1 \rightarrow \text{ROH}$  ( $\text{R}^1$  = alkyl, aryl, etc.) occur in the literature. For reactions of the type  $\text{RH} \rightarrow \text{ROH}$  ( $\text{R}$  = alkyl or aryl) see Section 41 (Alcohols and Phenols from Hydrides).

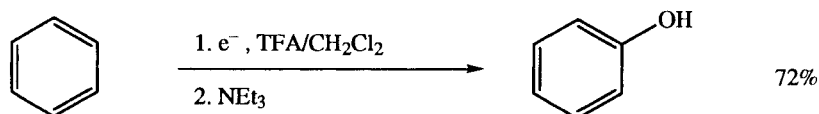




Hamada, T.; Irie, R.; Mihara, J.; Hamachi, K.; Katsuki, T. *Tetrahedron*, **1998**, *54*, 10017.

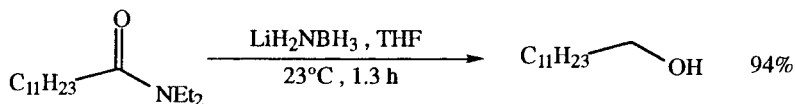


Smitrovich, J.H.; Woerpel, K.A. *J. Org. Chem.*, **1996**, *61*, 6044.



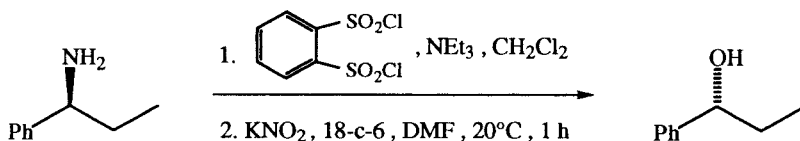
Fujimoto, K.; Toduda, Y.; Maekawa, H.; Matsubara, Y.; Mizuno, T.; Nishiguchi, I. *Tetrahedron*, **1996**, *52*, 3889.

## SECTION 36: ALCOHOLS AND THIOLS FROM AMIDES



Myers, A.G.; Yang, B.H.; Kopecky, D.J. *Tetrahedron Lett.* **1996**, *37*, 3623.

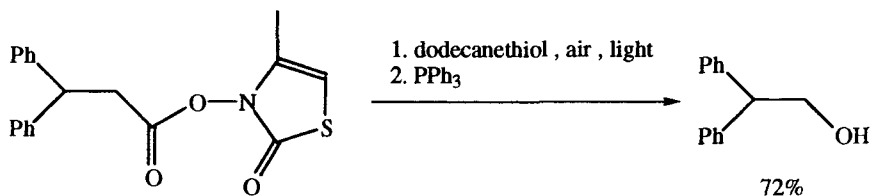
## SECTION 37: ALCOHOLS AND THIOLS FROM AMINES



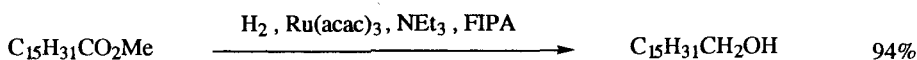
70% (40% ee)

Sørbye, K.; Tautermann, C.; Carlsen, P.; Fiksdahl, A. *Tetrahedron Asymmetry*, **1998**, *9*, 681

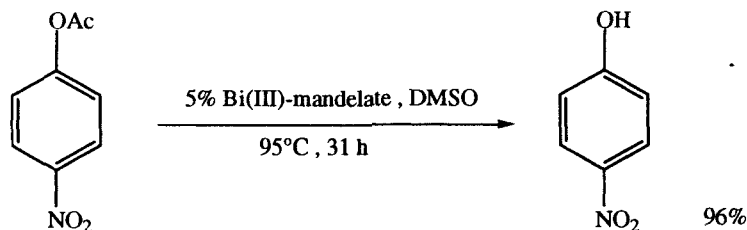
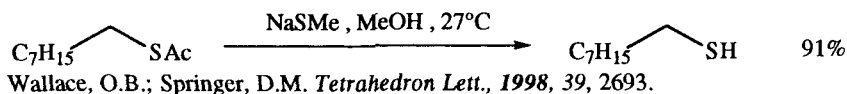
## SECTION 38: ALCOHOLS AND THIOLS FROM ESTERS



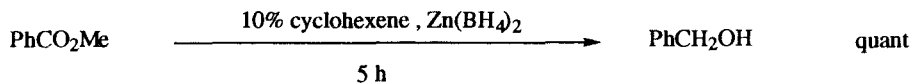
Barton, D.H.R.; Géro, S.D.; Holliday, P.; Quiclet-Sire, B.; Zard, S.Z.  
*Tetrahedron*, **1998**, *54*, 6751.



FIPA = 1,1,1,3,3,3-hexafluoropropan-2-ol  
Teunissen, H.T.; Elsevier, C.J. *Chem. Lett.*, **1998**, 1367.

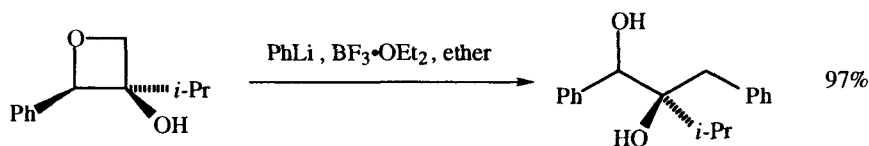


Le Boisselier, V.; Postel, M.; Duñach, E. *Tetrahedron Lett.*, **1997**, *38*, 2981.

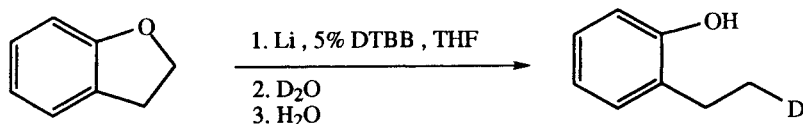


Narasimhan, S.; Madhavan, S.; Prasad, K.G. *Synth. Commun.*, **1997**, *27*, 385.

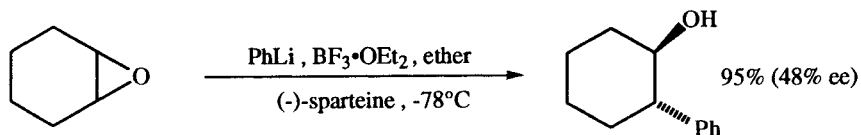
## SECTION 39: ALCOHOLS AND THIOLS FROM ETHERS, EPOXIDES AND THIOETHERS



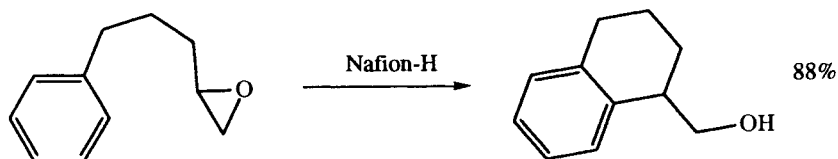
Bach, T.; Eilers, F. *Eur. J. Org. Chem.*, **1998**, 2161.



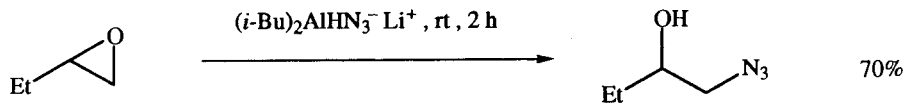
Bachki, A.; Foubelo, F.; Yus, M. *Tetrahedron Lett.*, **1998**, 39, 7759.



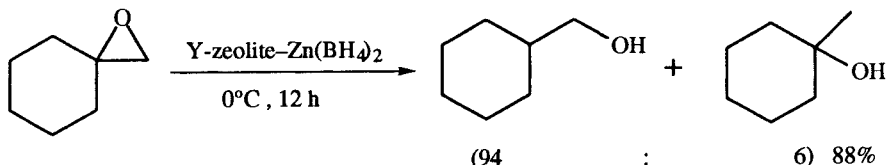
Alexakis, A.; Vrancken, E.; Mangeney, P. *SynLett.*, **1998**, 1165.



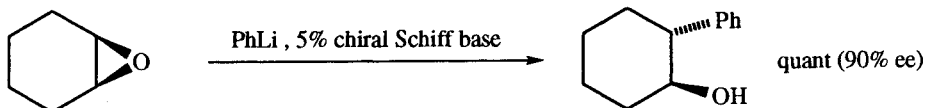
Taylor, S.K.; Dickinson, M.G.; May, S.A.; Pickering, D.A.; Sadek, P.C. *Synthesis*, **1998**, 1133.



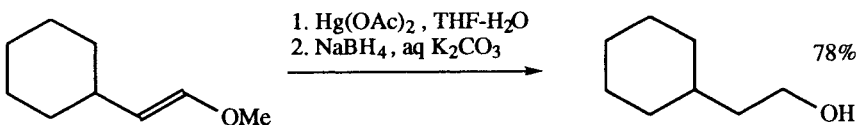
Youn, Y.S.; Cho, I.S.; Chung, B.Y. *Tetrahedron Lett.*, **1998**, 39, 4337.



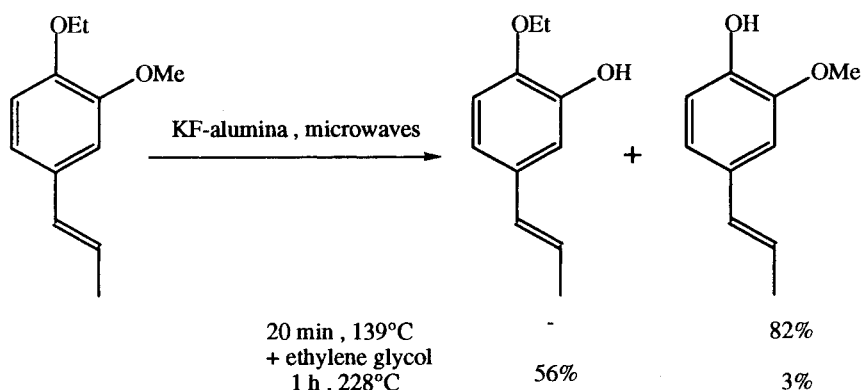
Sreekumar, R.; Padmakumar, R.; Rugmini, P. *Tetrahedron Lett.*, **1998**, 39, 5151.



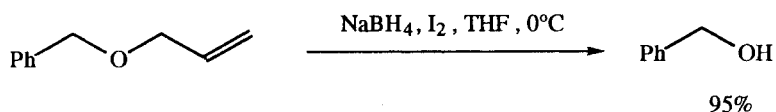
Oguni, N.; Miyagi, Y.; Itoh, K. *Tetrahedron Lett.*, **1998**, 39, 9023.



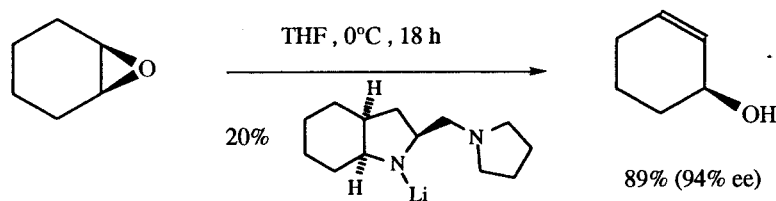
Crouch, R.D.; Mitten, J.V.; Span, A.R.; Dai, H.G. *Tetrahedron Lett.*, **1997**, 38, 791.



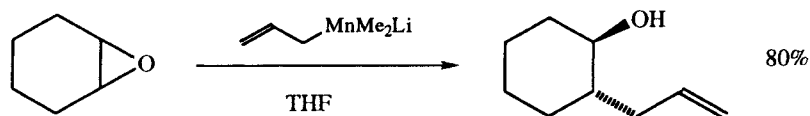
Ousaïd, A.; Thach, L.N.; Loupy, A. *Tetrahedron Lett.*, **1997**, 38, 2451.



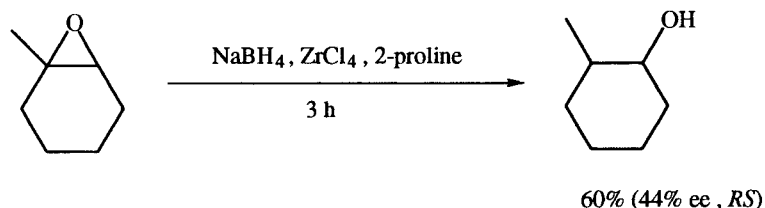
Thomas, R.M.; Mohan, G.H.; Iyengar, D.S. *Tetrahedron Lett.*, **1997**, 38, 4721.



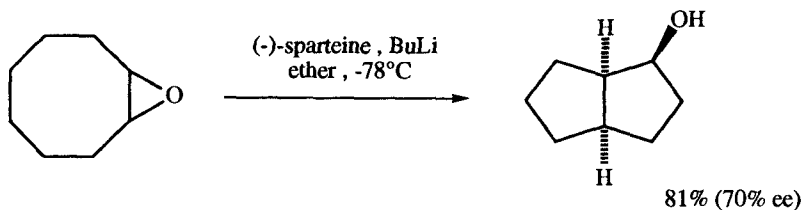
Asami, M.; Suga, T.; Honda, K.; Inoue, S. *Tetrahedron Lett.*, **1997**, 38, 6425.



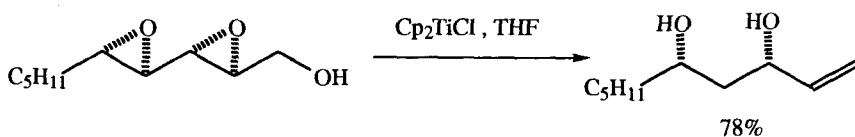
Tang, J.; Yorimitsu, H.; Kakiya, H.; Inoue, R.; Shinokubo, H.; Oshima, K. *Tetrahedron Lett.*, **1997**, 38, 901



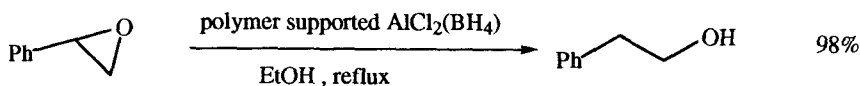
Laxmi, Y.R.S.; Iyengar, D.S. *Synth. Commun.*, **1997**, 27, 1731.



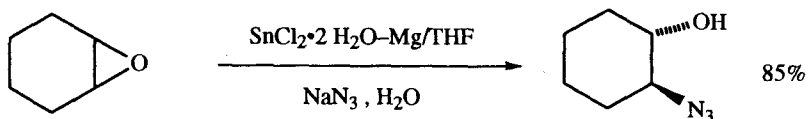
Hodgson, D.M.; Lee, C.P. *Tetrahedron Asymmetry*, **1997**, 8, 2307.



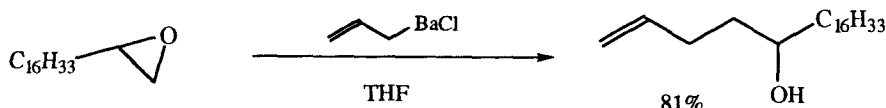
Yadav, J.S.; Srinivas, D. *Chem. Lett.*, **1997**, 905.



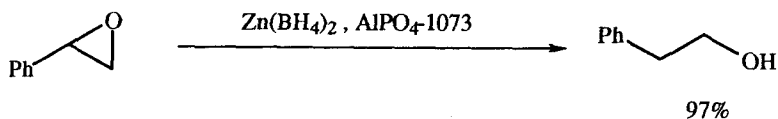
Tamami, B.; Lakouraj, M.M.; Yeganeh, H. *J. Chem. Res. (S)*, **1997**, 330.



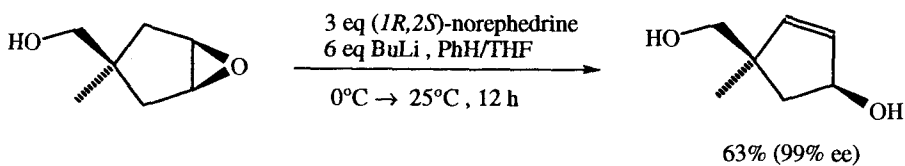
Sarangi, C.; Das, N.B.; Nanda, B.; Nayak, A.; Sharma, R.P. *J. Chem. Res., (S)*, **1997**, 378.



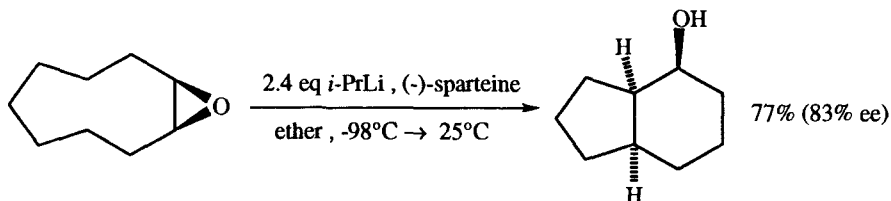
Yasue, K.; Yanagisawa, A.; Yamamoto, H. *Bull. Chem. Soc. Jpn.*, **1997**, 70, 493.



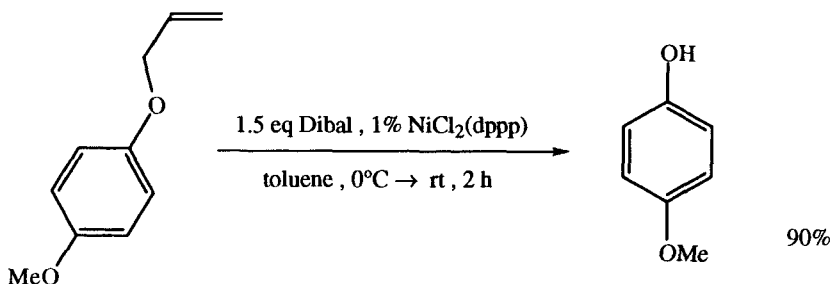
Campelo, J.M.; Chakraborty, R.; Marinas, J.M. *Synth. Commun.*, **1996**, 26, 415.



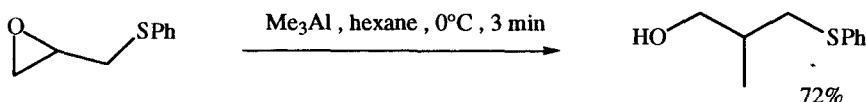
Hodgson, D.M.; Gibbs, A.R. *Tetrahedron Asymmetry*, **1996**, 7, 407.



Hodgson, D.M.; Lee, G.-P. *Chem. Commun.*, **1996**, 1015.



Taniguchi, T.; Ogasawara, K. *Angew. Chem. Int. Ed.*, **1998**, 37, 1136.



Liu, C.; Hashimoto, Y.; Kudo, K.; Saigo, K. *Bull. Chem. Soc. Jpn.*, **1996**, 69, 2095.

Additional examples of ether cleavages may be found in Section 45A (Protection of Alcohols and Thiols).

#### REVIEWS:

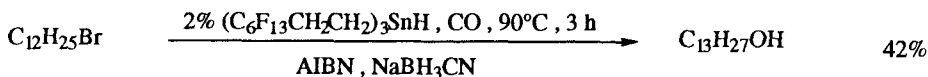
"Lewis Acid Induced Rearrangement of 1-Hetero-2,3-epoxides. Synthesis, Reactivity and Synthetic Applications of Homochiral Thiiranium and Aziridinium Ion Intermediates."

Rayner, C.M. *SynLett.*, **1997**, 11.

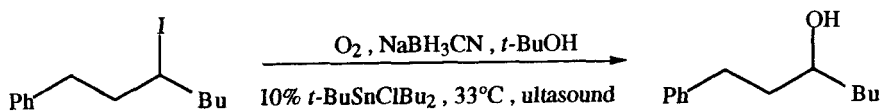
"Dealkylation of Ethers. A Review."

Ranu, B.C.; Bhar, S. *Org. Prep. Proceed. Int.*, **1996**, 28, 372.

#### SECTION 40: ALCOHOLS AND THIOLS FROM HALIDES AND SULFONATES

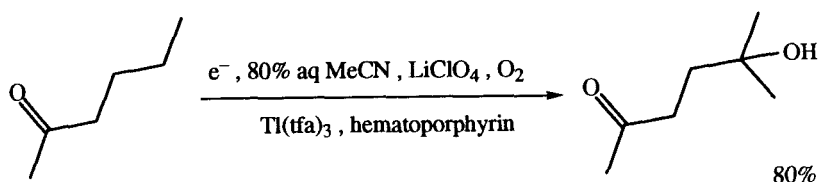


Ryu, I.; Niguma, T.; Minakata, S.; Komatsu, M.; Hadida, S.; Curran, D.P. *Tetrahedron Lett.*, **1997**, 38, 7883.

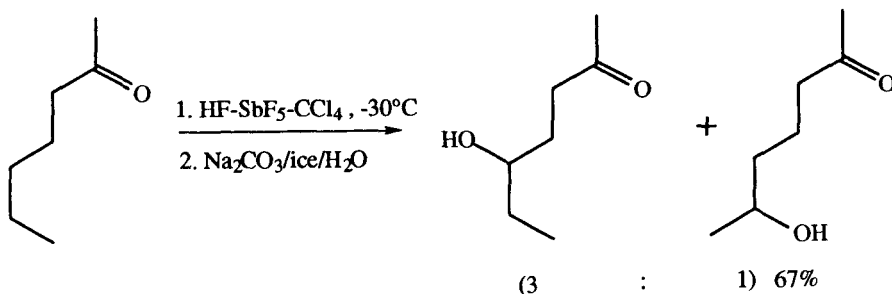


Sawamura, M.; Kawaguchi, Y.; Sato, K.; Nakamura, E. *Chem. Lett.*, **1997**, 705. 64%

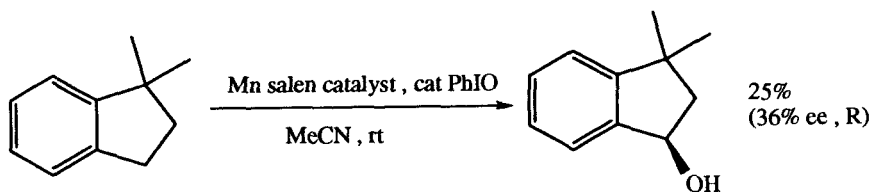
## SECTION 41: ALCOHOLS AND THIOLS FROM HYDRIDES



Maki, S.; Konno, K.; Takayama, H. *Tetrahedron Lett.*, **1997**, 38, 7067. 80%



Martin, A.; Jouannetaud, M.-P.; Jacquesy, J.-C. *Tetrahedron Lett.*, **1996**, 37, 2967.



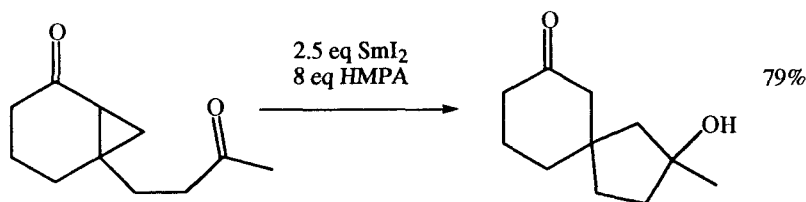
Hamachi, K.; Irie, R.; Katsuki, T. *Tetrahedron Lett.* **1996**, 37, 4979.

## SECTION 42: ALCOHOLS AND THIOLS FROM KETONES

The following reaction types are included in this section:

A. Reductions of Ketones to Alcohols

B. Alkylations of Ketones, forming Alcohols

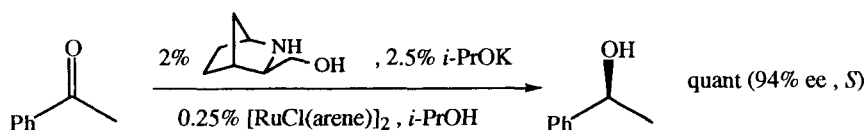


Molander, G.A.; Alonso-Alija, C. *Tetrahedron*, **1997**, 53, 8067.

Coupling of ketones to give diols is found in Section 323 (Alcohol  $\rightarrow$  Alcohol).

## SECTION 42A: REDUCTION OF KETONES TO ALCOHOLS

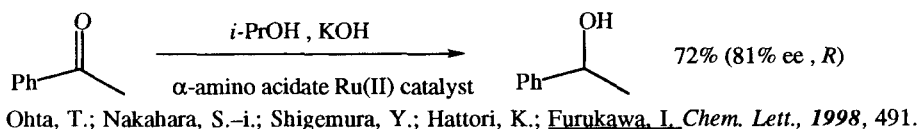
### ASYMMETRIC REDUCTION



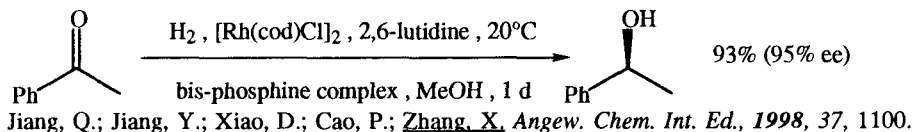
arene = hexamethylbenzene

Alonso, D.A.; Guijarro, D.; Pinho, P.; Temme, O.; Andersson, P.G. *J. Org. Chem.*, **1998**, 63, 2749.

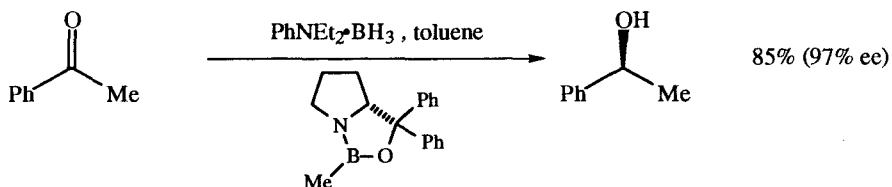
For an identical reaction using  $\text{B(OMe)}_3$  and  $\text{BH}_3\cdot\text{SMe}_2$ , see Pinho, P.; Guijarro, D.; Andersson, P.G. *Tetrahedron*, **1998**, 54, 7897.



Ohta, T.; Nakahara, S.-i.; Shigemura, Y.; Hattori, K.; Furukawa, I. *Chem. Lett.*, **1998**, 491.

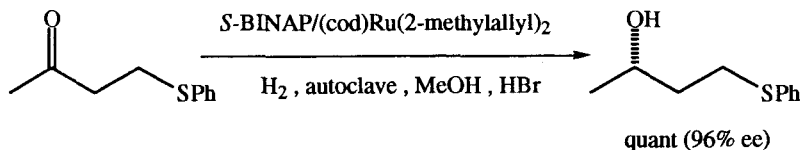


Jiang, Q.; Jiang, Y.; Xiao, D.; Cao, P.; Zhang, X. *Angew. Chem. Int. Ed.*, **1998**, 37, 1100.

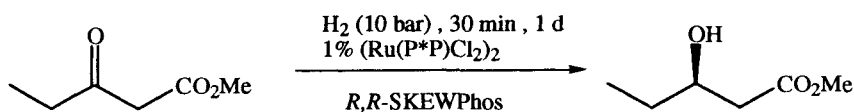


Salunkhe, A.M.; Burkhardt, E.R. *Tetrahedron Lett.*, **1997**, 38, 1523.





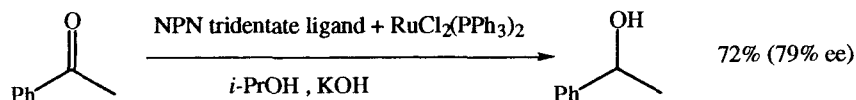
Tranchier, J.-P.; Ratovelomanana-Vidal, V.; Genêt, J.-P.; Tong, S.; Cohen, T.  
*Tetrahedron Lett.*, **1997**, 38, 2951.



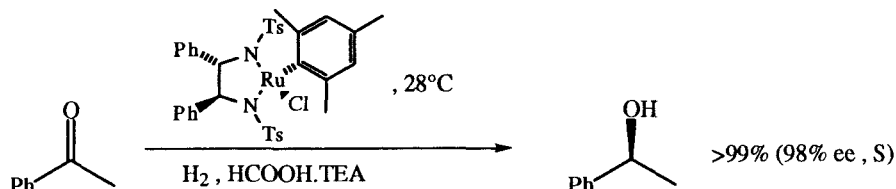
P\*P = chiral aryl bis-phosphine

quant (89% ee)

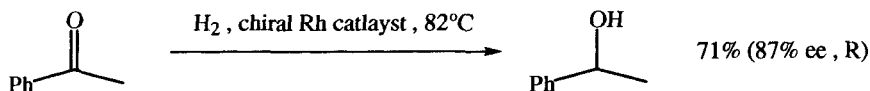
Blanc, D.; Henry, J.-C.; Ratovelomanana-Vidal, V.; Genêt, J.-P.  
*Tetrahedron Lett.*, **1997**, 38, 6603.



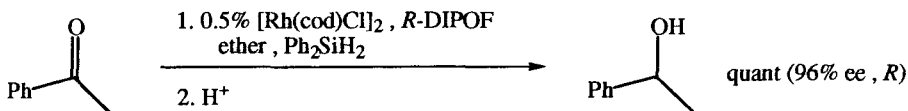
Jiang, Y.; Jiang, Q.; Zhu, G.; Zhang, X. *Tetrahedron Lett.*, **1997**, 38, 215.



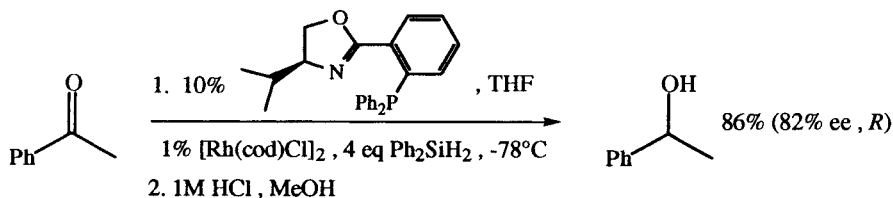
Fujii, A.; Hashiguchi, S.; Uematsu, N.; Ikariya, T.; Noyori, R.  
*J. Am. Chem. Soc.*, **1996**, 118, 2521.



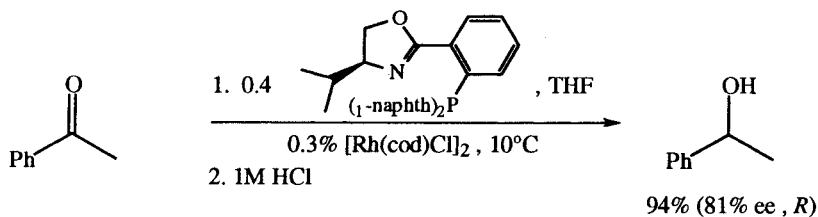
Langer, T.; Helmchen, G. *Tetrahedron Lett.*, **1996**, 37, 1381.



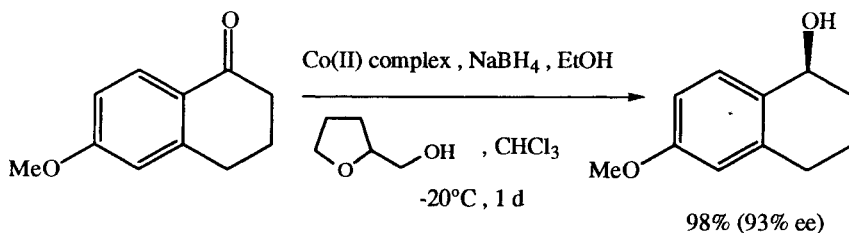
DIPOP = (SSS)-[2-(4,5-diphenyl-4,5-dihydro-1,3-oxazol-2-yl)ferrocenyl] diphenylphosphine  
 Nishibayashi, Y.; Segawa, K.; Takada, H.; Ohe, K.; Uemura, S. *Chem. Commun.*, **1996**, 847



Newman, L.M.; Williams, J.M.L.; McCague, R.; Potter, G.A.  
*Tetrahedron Asymmetry*, **1996**, 7, 1597.

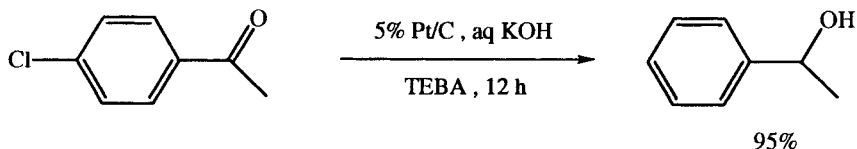


Langer, T.; Janssen, J.; Helmchen, G. *Tetrahedron Asymmetry*, **1996**, 7, 1599.

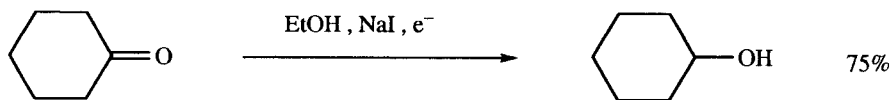


Sugi, K.D.; Nagata, T.; Yamada, T.; Mukaiyama, T. *Chem. Lett.*, **1996**, 737.

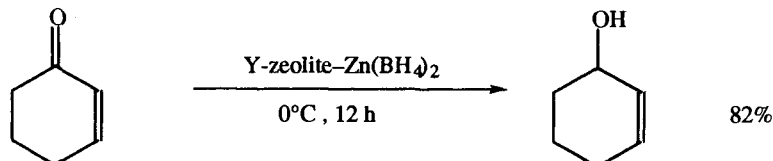
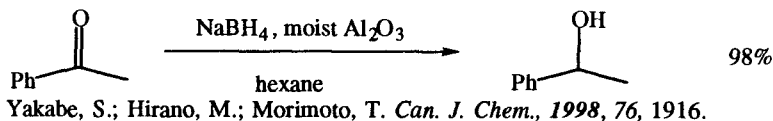
## NON-ASYMMETRIC REDUCTION



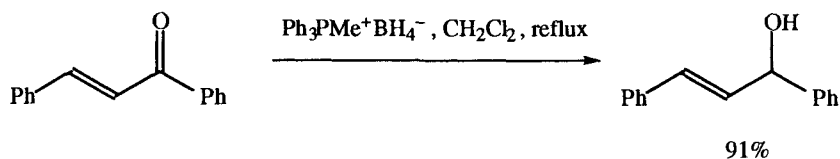
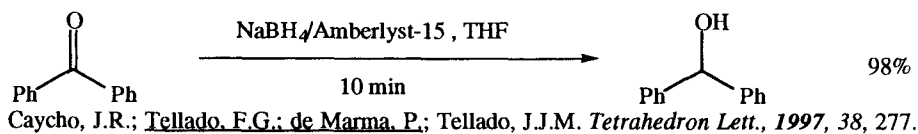
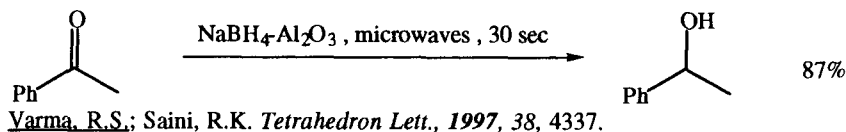
Selva, M.; Tundo, P.; Perosa, A. *J. Org. Chem.*, **1998**, 63, 3266.



Wei-Dong, Y.; Cli, Y.; Ar-Xing, W. *Synth. Commun.*, **1998**, 28, 2827.



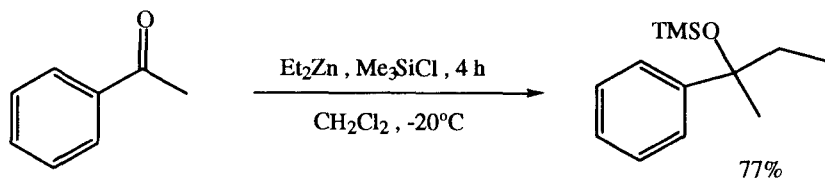
Sreekumar, R.; Padmakumar, R.; Rugmini, P. *Tetrahedron Lett.*, **1998**, 39, 5151.



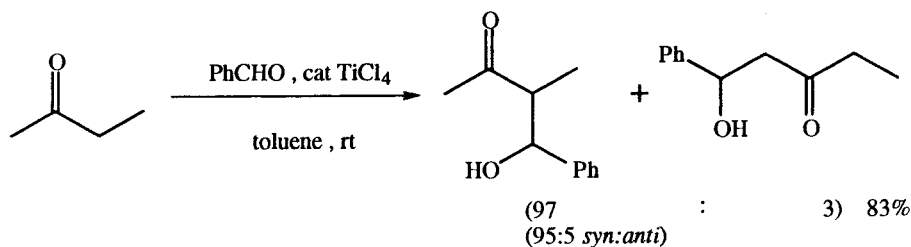
Firouzabadi, H.; Adibi, M. *Synth. Commun.*, **1996**, 26, 2429.

## SECTION 42B: ALKYLATION OF KETONES, FORMING ALCOHOLS

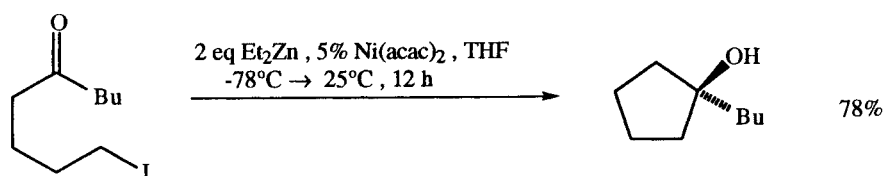
Aldol reactions are listed in Section 330 (Ketone-Alcohol)



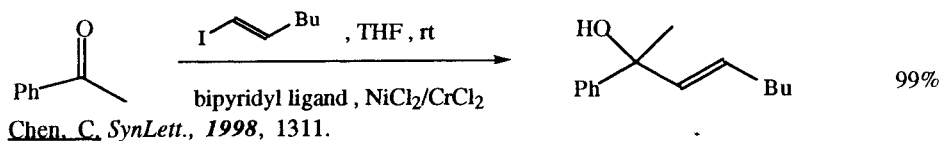
Alvisi, C.; Casolari, S.; Costa, A.L.; Ritiani, M.; Tagliavini, E. *J. Org. Chem.* **1998**, 63, 1330.



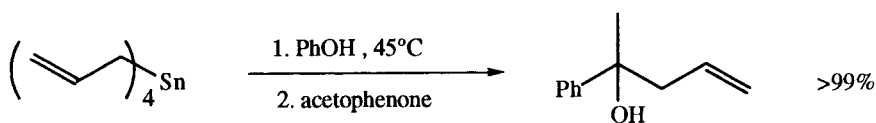
Doas, P.I.; Fu, G.C. *J. Am. Chem. Soc.*, **1998**, 120, 445.



Stüdemann, T.; Ibrahim-Ouali, M.; Cahiez, G.; Knochel, P. *SynLett.*, **1998**, 143.

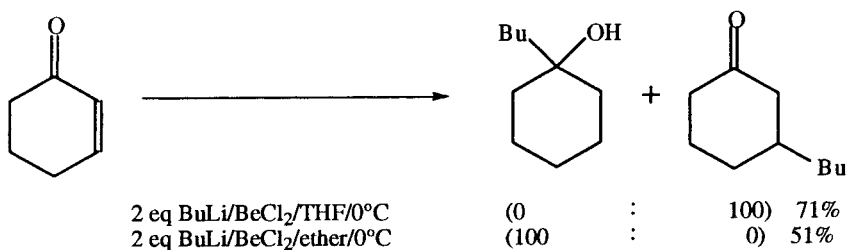


Chen, C. *SynLett.*, **1998**, 1311.

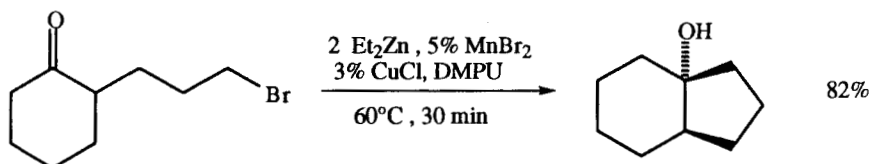


without phenol, yield is <5%

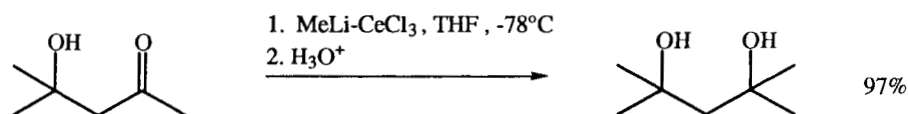
Yasuda, M.; Kitahara, N.; Fujibayashi, T.; Baba, A. *Chem. Lett.*, **1998**, 743.



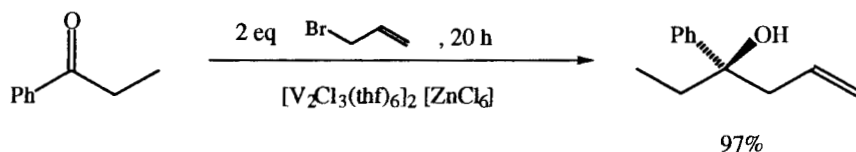
Krief, A.; de Vos, M.J.; De Lombart, S.; Bosref, J.; Couty, F. *Tetrahedron Lett.*, **1997**, 38, 6295.



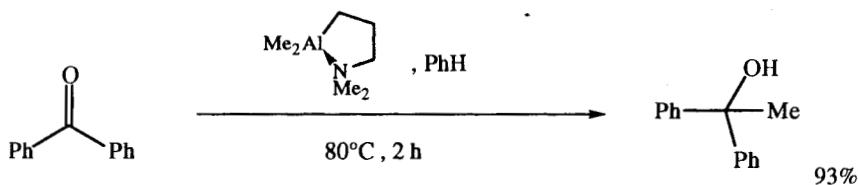
Riguet, E.; Klement, I.; Reddy, Ch.K.; Cabiez, G.; Knochel, P. *Tetrahedron Lett.*, **1996**, 37, 5865.



Bartoli, G.; Bosco, M.; Van Beek, J.; Sambri, L.; Marcantoni, E. *Tetrahedron Lett.*, **1996**, 37, 2293.



Kataoka, Y.; Makihara, I.; Tani, K. *Tetrahedron Lett.*, **1996**, 37, 7083.

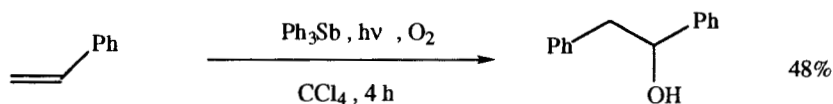


Baidossi, W.; Resenfeld, A.; Wassermann, B.C.; Schulte, S.; Schumann, H.; Blum, J. *Synthesis*, **1996**, 1127.

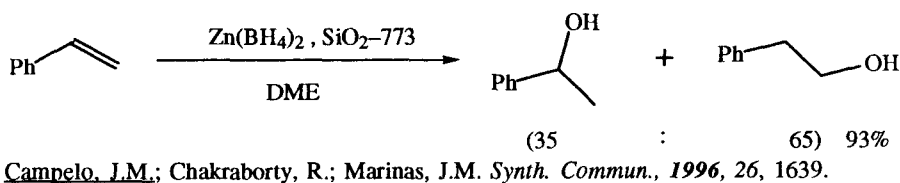
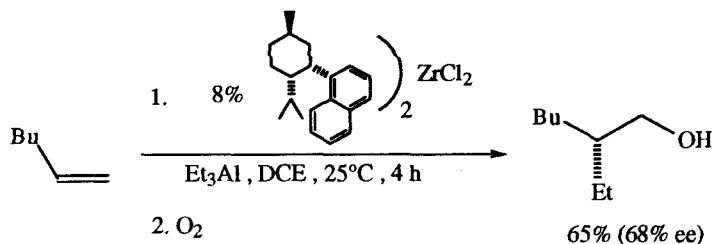
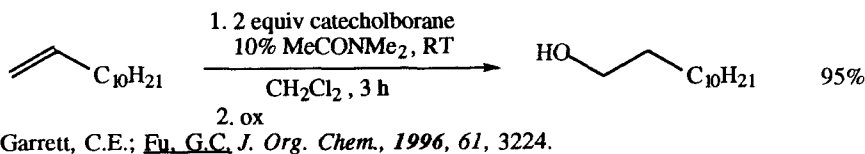
## SECTION 43: ALCOHOLS AND THIOLS FROM NITRILES

NO ADDITIONAL EXAMPLES

## SECTION 44: ALCOHOLS AND THIOLS FROM ALKENES



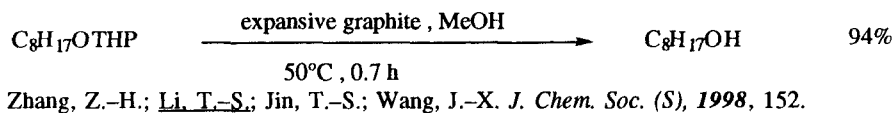
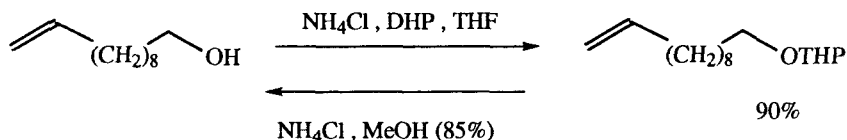
Kakusawa, N.; Tsuchiya, T.; Kurita, I. *Tetrahedron Lett.*, **1998**, 39, 9743.

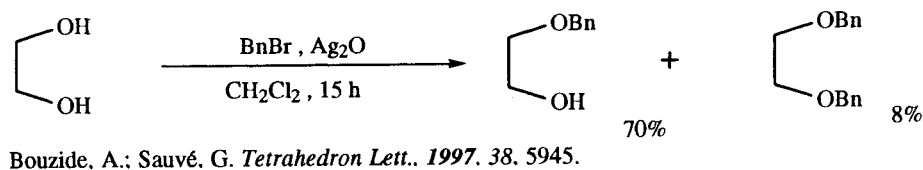
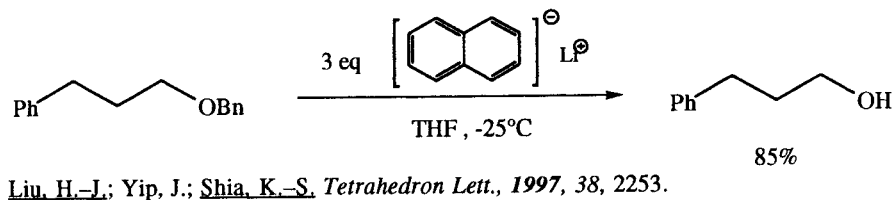
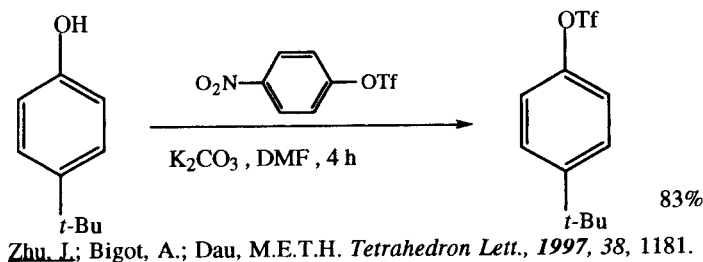
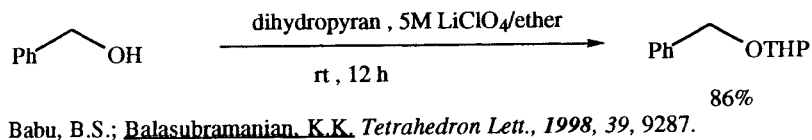
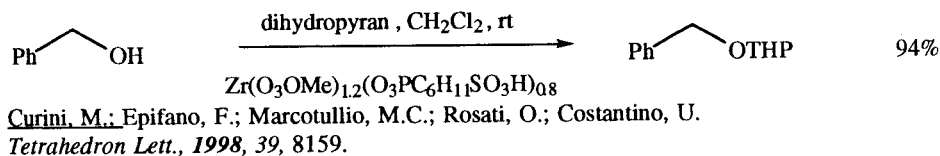
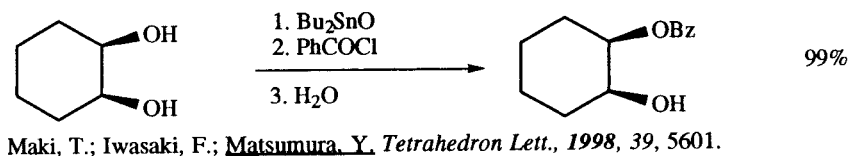
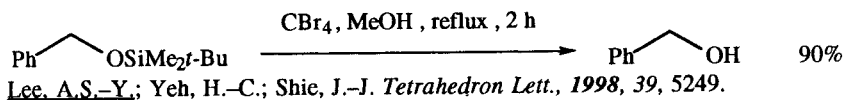


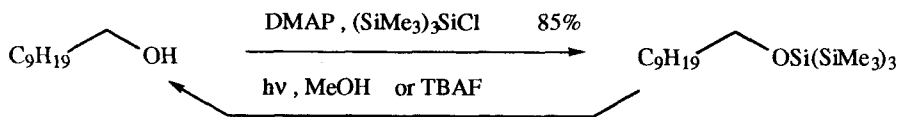
## SECTION 45: ALCOHOLS AND THIOLS FROM MISCELLANEOUS COMPOUNDS

NO ADDITIONAL EXAMPLES

### SECTION 45A: PROTECTION OF ALCOHOLS AND THIOLS

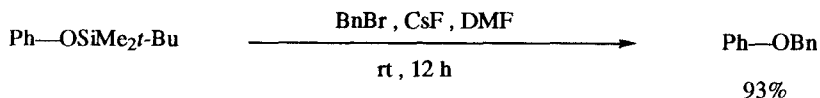




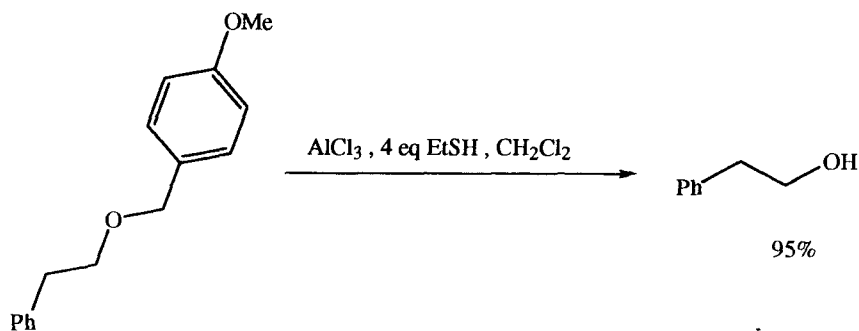


68%

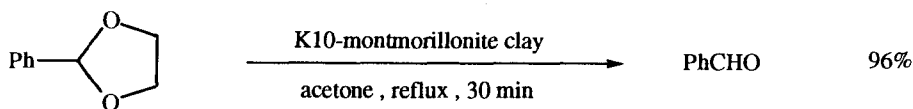
Brook, M.A.; Gottardo, C.; Balduzzi, S.; Mohamed, M. *Tetrahedron Lett.*, **1997**, 38, 6997.



Oriyama, T.; Noda, K.; Yatabe, K. *SynLett.*, **1997**, 701.

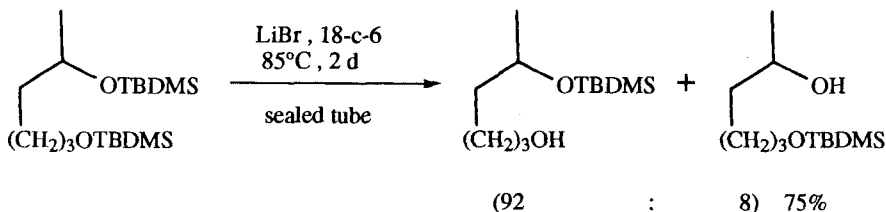


Bouzide, A.; Sauv , G. *SynLett.*, **1997**, 1153.

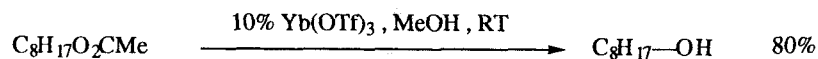


also works with ketals

Li, T.-S.; Li, S.-H. *Synth. Commun.*, **1997**, 27, 2299.

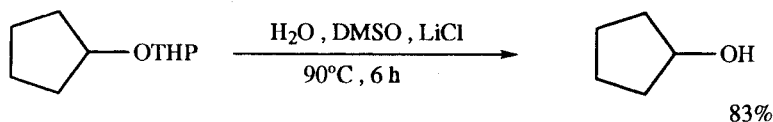


Tandon, M.; Begley, T.P. *Synth. Commun.*, **1997**, 27, 2953.

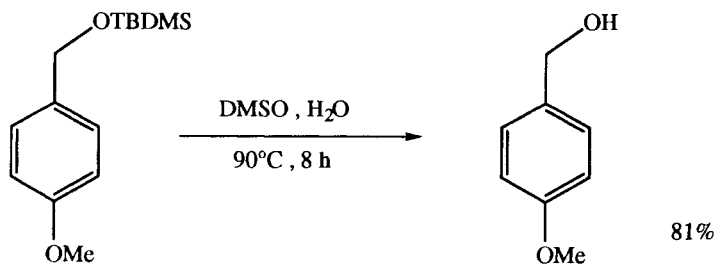


Hanamoto, T.; Sugimoto, Y.; Yokoyama, Y.; Inanaga, J. *J. Org. Chem.*, **1996**, 61, 4491.

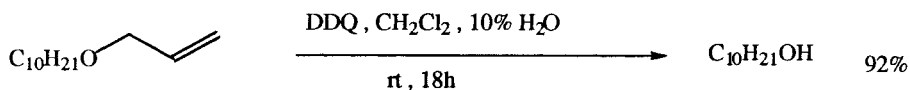




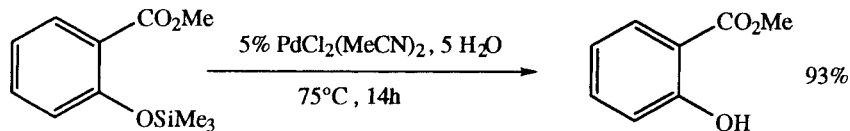
Maiti, G.; Roy, S.C. *J. Org. Chem.*, **1996**, *61*, 6038.



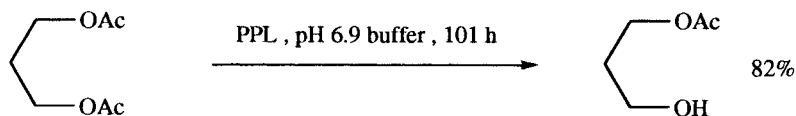
Maiti, G.; Roy, S.C. *Tetrahedron Lett.*, **1997**, *38*, 495.



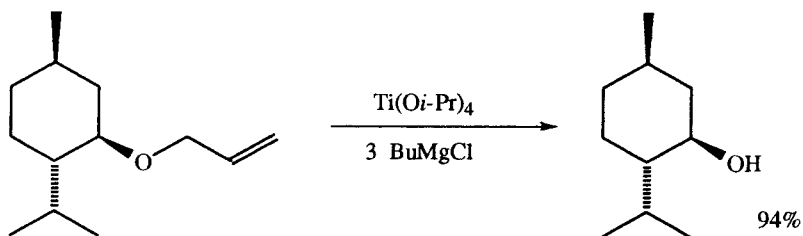
Yadav, J.S.; Chandrasekhar, S.; Sumithra, G.; Kache, R. *Tetrahedron Lett.*, **1996**, *37*, 6603.



Wilson, N.S.; Keay, B.A. *Tetrahedron Lett.*, **1996**, *37*, 153.



Houille, O.; Schmittberger, T.; Uguen, D. *Tetrahedron Lett.*, **1996**, *37*, 625.



Lee, J.; Cha, J.K. *Tetrahedron Lett.*, **1996**, *37*, 3663.



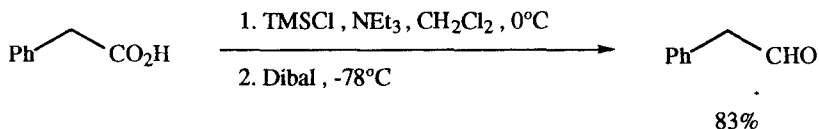
## CHAPTER 4

### PREPARATION OF ALDEHYDES

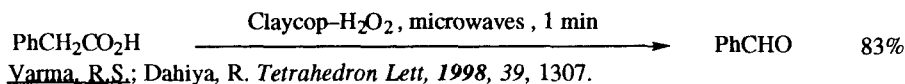
#### SECTION 46: ALDEHYDES FROM ALKYNES

NO ADDITIONAL EXAMPLES

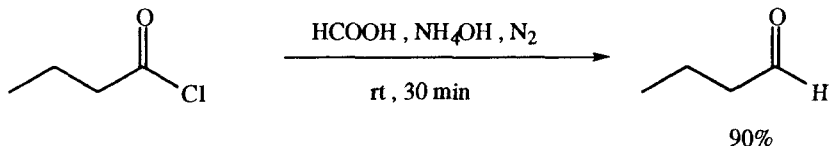
#### SECTION 47: ALDEHYDES FROM ACID DERIVATIVES



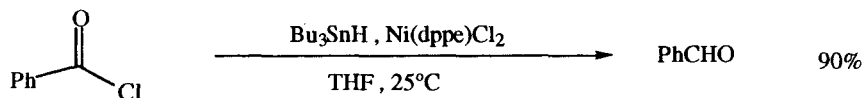
Chandrasekhar, S.; Kumar, M.S.; Muralidhar, B. *Tetrahedron Lett*, **1998**, 39, 909.



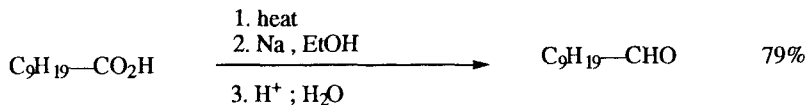
Varma, R.S.; Dahiya, R. *Tetrahedron Lett*, **1998**, 39, 1307.



Shamsuddin, K.M.; Zubairi, Md.O.; Musharraf, M.A. *Tetrahedron Lett.*, **1998**, 39, 8153.

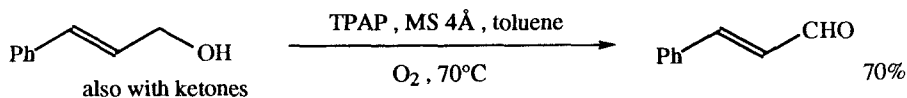


Malanga, C.; Mannucci, S.; Lardicci, L. *Tetrahedron Lett*, **1997**, 38, 8093.

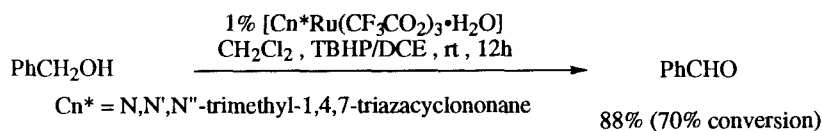


Shi, Z.; Gu, H. *Synth. Commun.*, **1997**, 27, 2701.

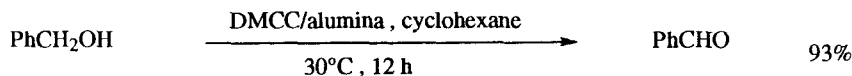
## SECTION 48: ALDEHYDES FROM ALCOHOLS AND THIOLS



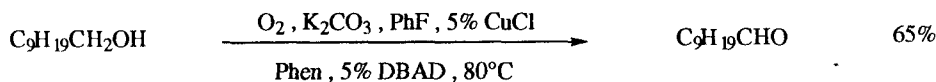
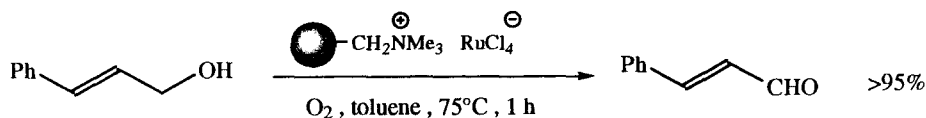
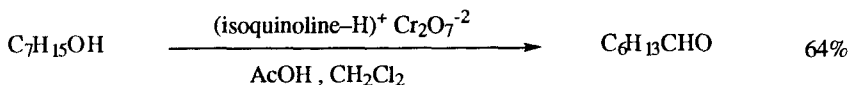
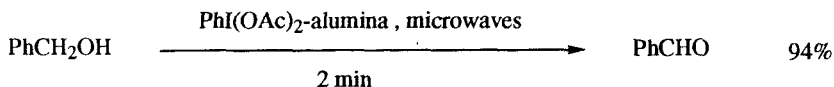
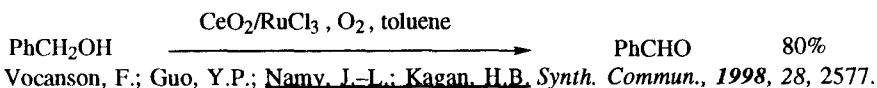
TPAP = tetrapropylammonium perruthenate

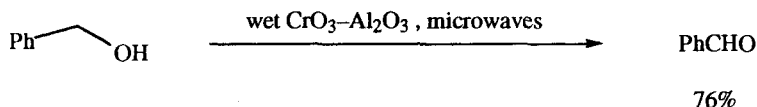
Mahrwald, R.; Gündogan, B. *J. Am. Chem. Soc.*, **1998**, 120, 413.

also, with 2° alcohols to ketones

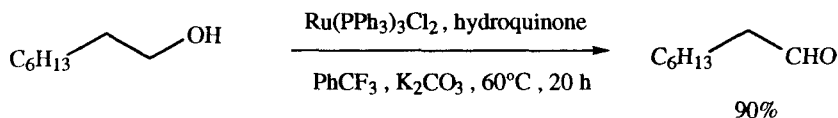
Fung, W.-H.; Yu, W.-Y.; Che, C.-M. *J. Org. Chem.*, **1998**, 63, 2873.

DMCC = dimethylammonium dichlorochromate

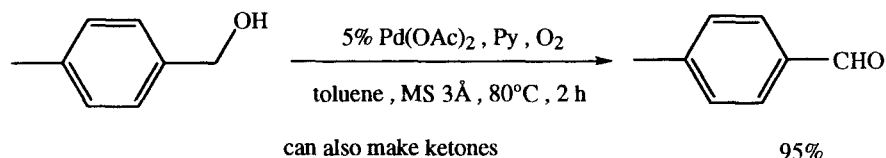
Zhang, G.-S.; Shi, Q.-Z.; Chen, M.-F.; Cai, K. *Org. Prep. Proceed. Int.*, **1998**, 30, 215.Markó, I.E.; Gautier, A.; Chellé-Regnaut, I.; Giles, P.R.; Tsukazaki, M.; Urch, C.J.; Brown, S.M. *J. Org. Chem.*, **1998**, 63, 7576.Hinzen, B.; Lenz, R.; Ley, S.V. *Synthesis*, **1998**, 977.Srinivasan, R.; Akila, S.; Caroline, J.; Balasubramanian, K.K. *Synth. Commun.*, **1998**, 28, 2245.Varma, R.S.; Saini, R.K.; Dahiya, R. *J. Chem. Res. (S)*, **1998**, 120.



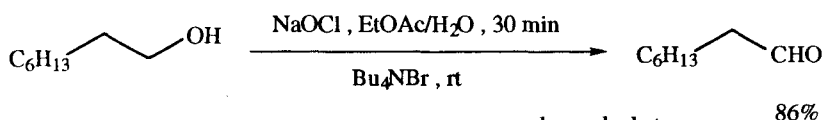
Varma, R.S.; Saini, R.K. *Tetrahedron Lett.*, **1998**, 39, 1481.



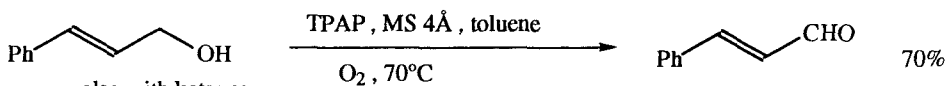
Hanyu, A.; Takezawa, E.; Sakaguchi, S.; Ishii, Y. *Tetrahedron Lett.*, **1998**, 39, 5557.



Nishimura, T.; Onoue, T.; Ohe, K.; Uemura, S. *Tetrahedron Lett.*, **1998**, 39, 6011.

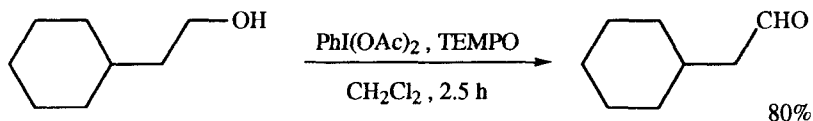


Mirafzal, G.A.; Lozeva, A.M. *Tetrahedron Lett.*, **1998**, 39, 7263.

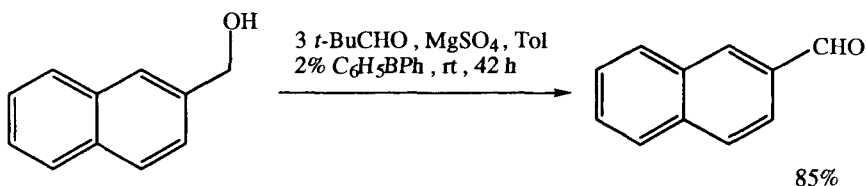


TPAP = tetrapropylammonium perruthenate

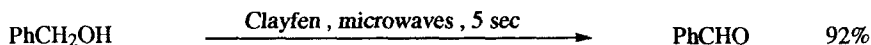
Markó, I.E.; Giles, P.R.; Tsukazaki, M.; Chellé-Regnaut, I.; Urch, C.J.; Brown, S.M. *J. Am. Chem. Soc.*, **1997**, 119, 12661.



DeMico, A.; Margarita, R.; Parlanti, L.; Vescovi, A.; Piancatelli, G. *J. Org. Chem.*, **1997**, 62, 6974.

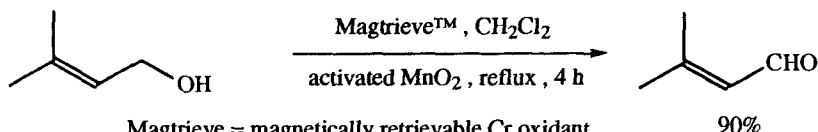


Ishihara, K.; Kurihara, H.; Yamamoto, H. *J. Org. Chem.*, **1997**, 62, 5664.



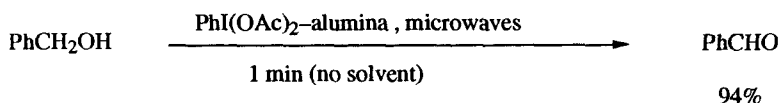
also with 2° alcohols

Varma, R.S.; Dahiya, R. *Tetrahedron Lett.*, **1997**, 38, 2043.

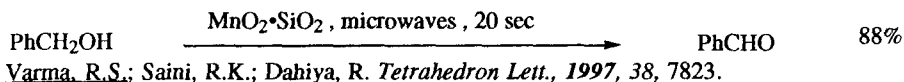


Magtrieve = magnetically retrievable Cr oxidant

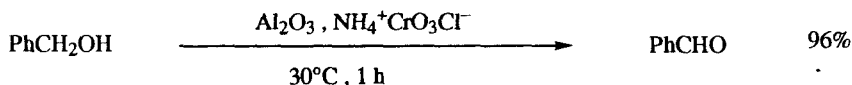
Lee, R.A.; Donald, D.S. *Tetrahedron Lett.*, **1997**, 38, 3857.



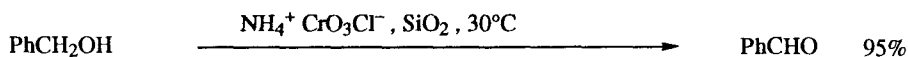
Varma, R.S.; Dahiya, R.; Saini, R.K. *Tetrahedron Lett.*, **1997**, 38, 7029.



Varma, R.S.; Saini, R.K.; Dahiya, R. *Tetrahedron Lett.*, **1997**, 38, 7823.

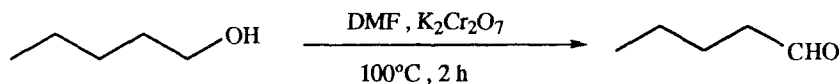


Zhang, G.-S.; Shi, Q.-Z.; Chen, M.-F.; Cai, K. *Synth. Commun.*, **1997**, 27, 953.

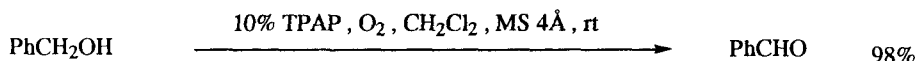


can also form ketones

Zhang, G.-S.; Shi, Q.-Z.; Chen, M.-F.; Cai, K. *Synth. Commun.*, **1997**, 27, 3691.

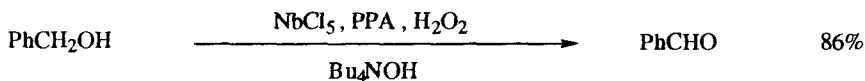


Lou, J.-D.; Lu, L.-H. *Synth. Commun.*, **1997**, 27, 3701.

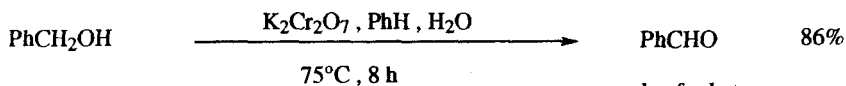


also for ketones

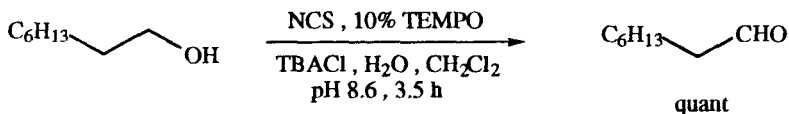
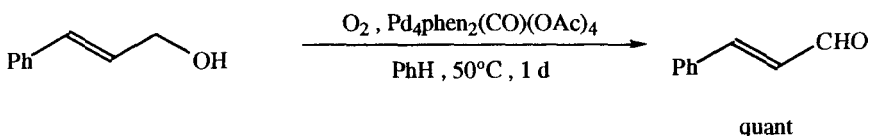
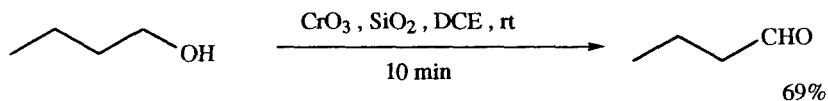
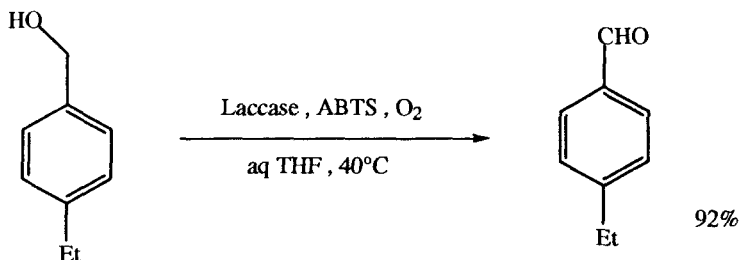
Lenz, R.; Ley, S.V. *J. Chem. Soc., Perkin Trans. 1*, **1997**, 3291.



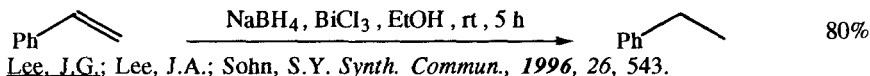
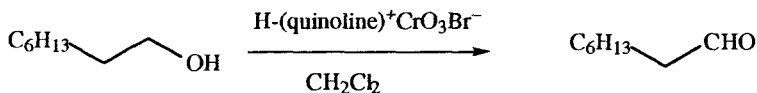
de Souza Batista, C.M.; de Souza Melo, S.C.; Gelbard, G.; Lachter, E.R. *J. Chem. Res. (S)*, **1997**, 92.



also for ketones

Lou, J.-D. *J. Chem. Res. (S)*, **1997**, 206.Einhorn, J.; Einhorn, C.; Ratajczak, F.; Pierre, J.-L. *J. Org. Chem.*, **1996**, 61, 7452.Kaneda, K.; Fujii, M.; Morioka, K. *J. Org. Chem.*, **1996**, 61, 4502.Khadilkar, B.; Chitnavis, A.; Khare, A. *Synth. Commun.*, **1996**, 26, 205.

ABTS = 2,2'-azino'bis-(3-ethylbenzothiazoline)-6-sulfonic acid

Rosenau, T.; Potthast, A.; Chen, C.L.; Gratzl, J.S. *Synth. Commun.*, **1996**, 26, 315.Lee, J.G.; Lee, J.A.; Sohn, S.Y. *Synth. Commun.*, **1996**, 26, 543.Özgün, B.; Değirmenbaşı, N. *Synth. Commun.*, **1996**, 26, 3601.

**REVIEW:**

"On the Use of Stable Organic Nitroxyl Radicals for the Oxidation of Primary and Secondary Alcohols."

deNooy, A.E.J.; Besemer, A.C.; Bekkum, H. *Synthesis*, **1996**, 1153.

**SECTION 49: ALDEHYDES FROM ALKYNES**

Conjugate reductions and Michael Alkylations of conjugated aldehydes are listed in Section 74 (Alkyls from Alkenes).

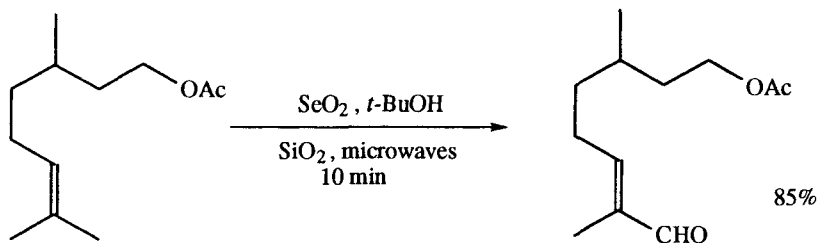
NO ADDITIONAL EXAMPLES

Related Methods:

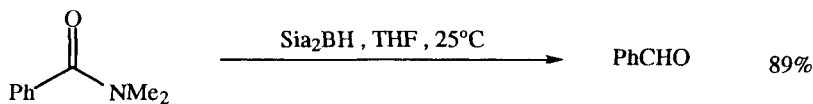
Aldehydes from Ketones (Section 57)

Ketones from Ketones (Section 177)

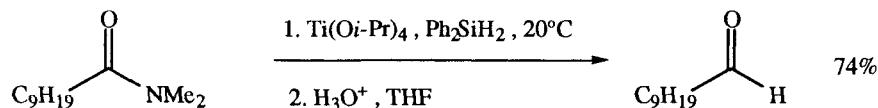
Also via: Alkenyl aldehydes (Section 341)

**SECTION 50: ALDEHYDES FROM ALKYLs, METHYLENES AND ARYLS**

Singh, J.; Sharma, M.; Kad, G.L.; Chhabra, B.R. *J. Chem. Res. (S)*, **1997**, 264.

**SECTION 51: ALDEHYDES FROM AMIDES**

Godjoian, G.; Singaram, B. *Tetrahedron Lett.*, **1997**, 38, 1717.



Bower, S.; Kreutzer, K.A.; Buchwald, S.L. *Angew. Chem. Int., Ed.*, **1996**, 35, 1515.



## SECTION 52: ALDEHYDES FROM AMINES

NO ADDITIONAL EXAMPLES

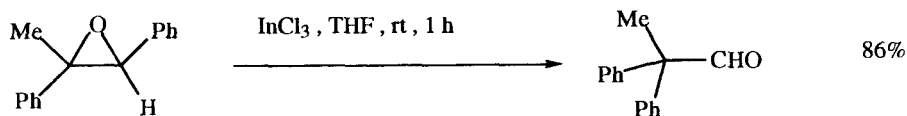
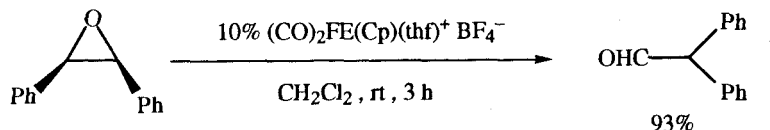
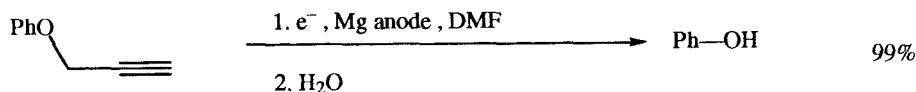
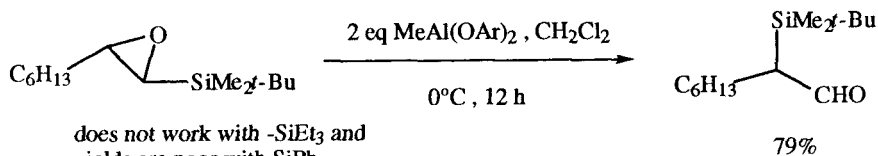
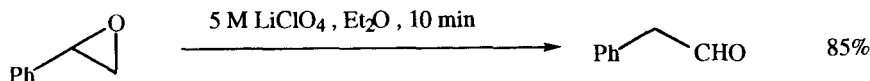
Related Methods:

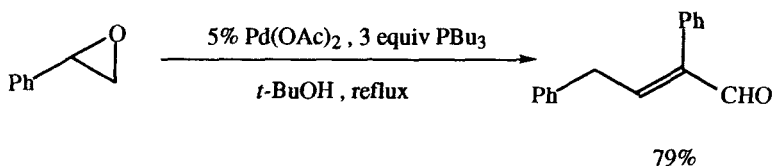
Ketones from Amines (Section 172)

## SECTION 53: ALDEHYDES FROM ESTERS

NO ADDITIONAL EXAMPLES

## SECTION 54: ALDEHYDES FROM ETHERS, EPOXIDES AND THIOETHERS

Ranu, B.C.; Jana, U. *J. Org. Chem.*, **1998**, 63, 8212.Picione, J.; Mahmood, S.J.; Gill, A.; Hilliard, M.; Hossain, M.M. *Tetrahedron Lett.*, **1998**, 39, 2681.Olivero, S.; Duñach, E. *Tetrahedron Lett.*, **1997**, 38, 6193.Ooi, T.; Kiba, T.; Maruoka, K. *Chem. Lett.*, **1997**, 519.Sudha, R.; Narasimhan, K.M.; Saraswathy, V.G.; Sankararaman, S. *J. Org. Chem.*, **1996**, 61, 1877.

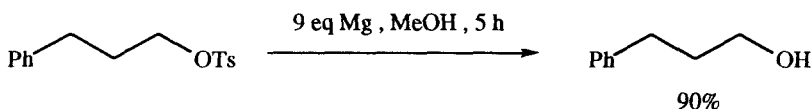


Kim, J.-H.; Kulawiec, R.J. *J. Org. Chem.*, **1996**, 61, 7656.

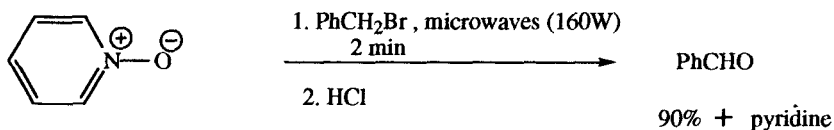
Related Methods:

Ketones from Ethers and Epoxides (Section 174)

## SECTION 55: ALDEHYDES FROM HALIDES AND SULFONATES

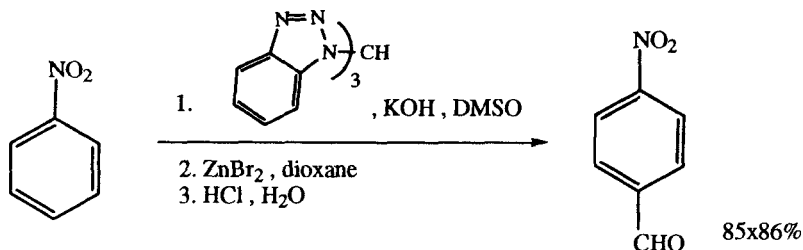


Sridhar, M.; Kumar, B.A.; Narender, R. *Tetrahedron Lett.*, **1998**, 39, 2847.



Barbry, D.; Champagne, P. *Tetrahedron Lett.*, **1996**, 37, 7725.

## SECTION 56: ALDEHYDES FROM HYDRIDES



Katritzky, A.R.; Xie, L. *Tetrahedron Lett.* **1996**, 37, 347.

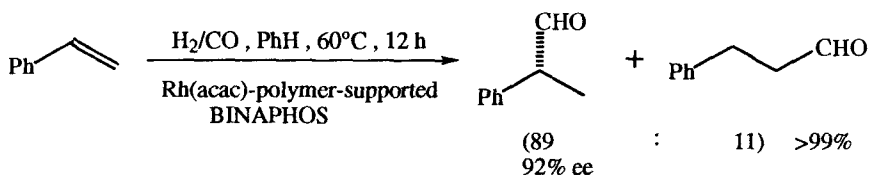
## SECTION 57: ALDEHYDES FROM KETONES

NO ADDITIONAL EXAMPLES

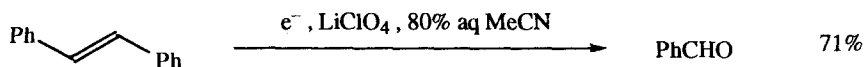
## SECTION 58: ALDEHYDES FROM NITRILES

NO ADDITIONAL EXAMPLES

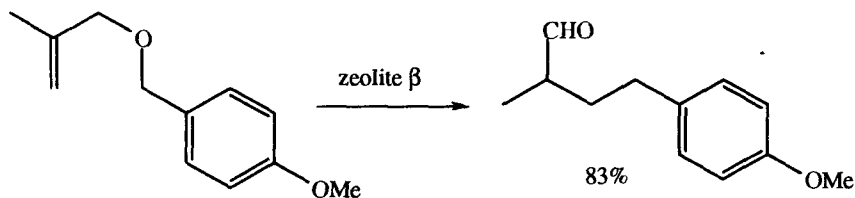
## SECTION 59: ALDEHYDES FROM ALKENES



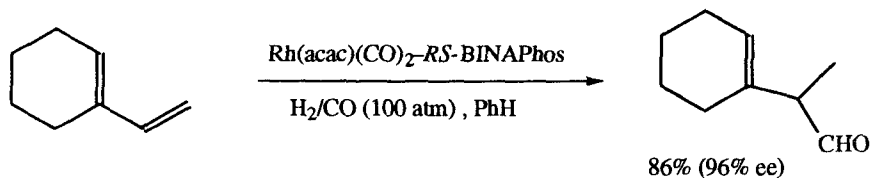
Nozaki, K.; Itoi, Y.; Shibahara, F.; Shirakawa, E.; Ohta, T.; Takaya, H.; Hiyama, T.  
*J. Am. Chem. Soc.*, **1998**, *120*, 4051.



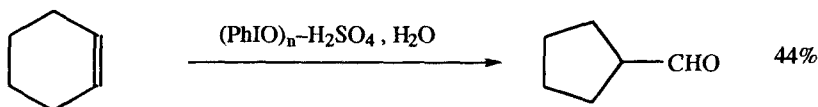
Maki, S.; Niwa, H.; Hirano, T. *SynLett*, **1997**, 1385.



Wennerberg, J.; Eklund, L.; Polla, M.; Frejd, T. *Chem. Commun.*, **1997**, 445.



Horiuchi, T.; Ohta, T.; Nozaki, K.; Takaya, H. *Chem. Commun.*, **1996**, 155.



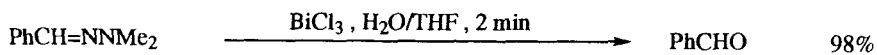
Moriarty, R.M.; Prakash, O.; Duncan, M.P.; Vaid, R.K.; Rani, N.  
*J. Chem. Res. (S)*, **1996**, 432.

## Related Methods:

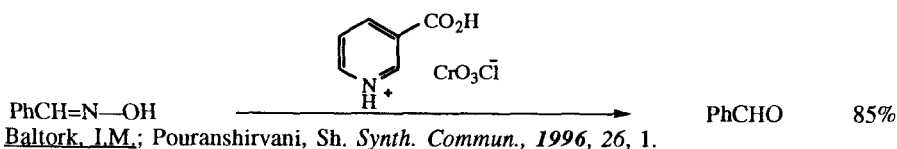
## Ketones from Alkenes (Section 179)

**SECTION 60: ALDEHYDES FROM MISCELLANEOUS COMPOUNDS**

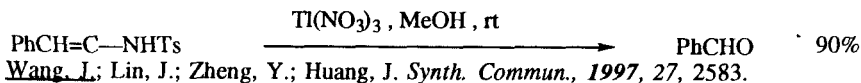
Pérez G., C. S.; Pérez, G S.; Zavalas, M.A.; Pérez G., R.M.; Guadarrama M, F.O. *Synth. Commun.*, **1998**, 28, 3011.



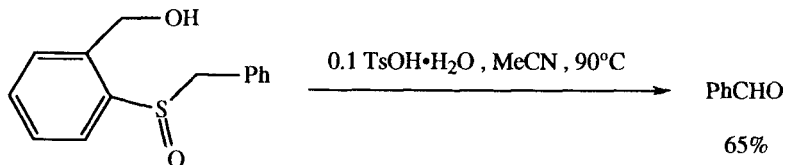
Boruah, A.; Baruah, B.; Prajapati, D.; Sandhu, J.S. *SynLett*, **1997**, 1251.



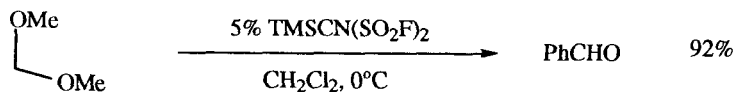
Baltork, I.M.; Pouranshirvani, Sh. *Synth. Commun.*, **1996**, 26, 1.



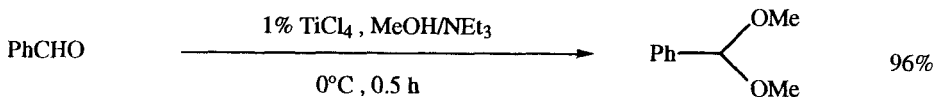
Wang, J.; Lin, J.; Zheng, Y.; Huang, J. *Synth. Commun.*, **1997**, 27, 2583.



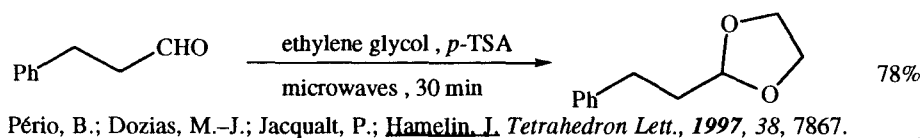
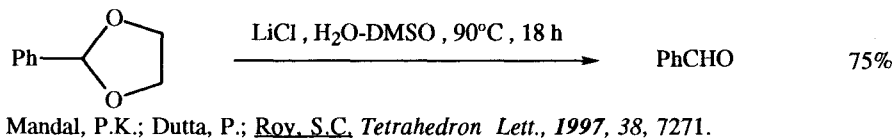
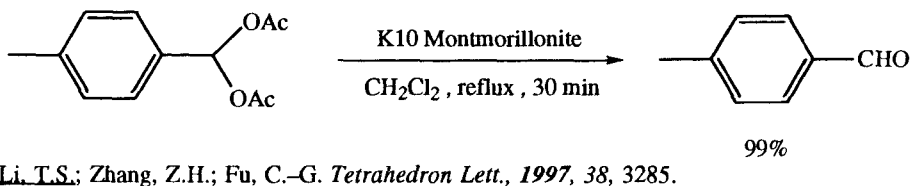
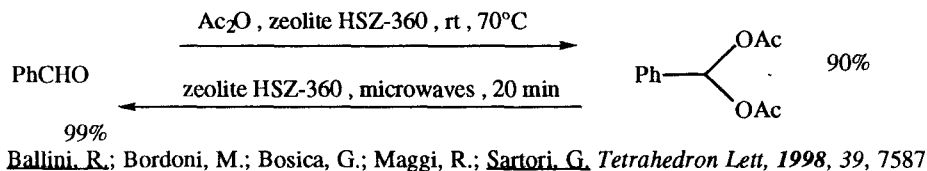
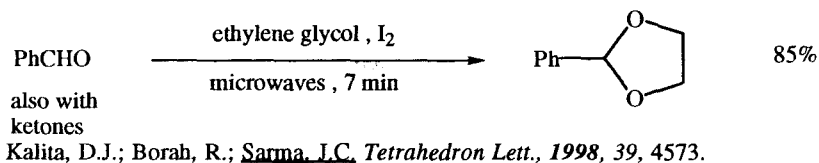
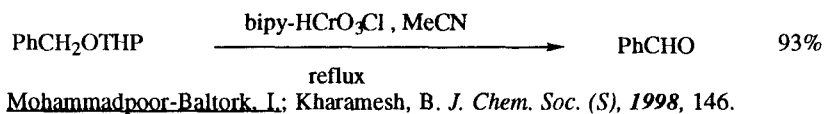
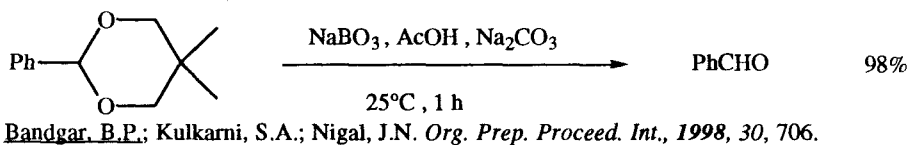
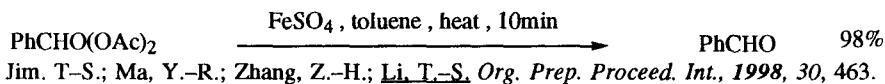
Naka, H.; Sato, S.; Horn, E.; Furukawa, N. *Heterocycles*, **1997**, 46, 177.

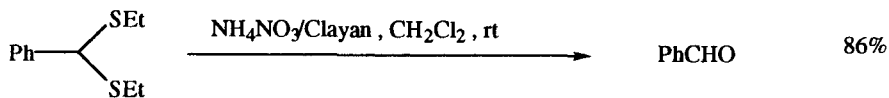
**SECTION 60A: PROTECTION OF ALDEHYDES**

Kaur, G.; Trehan, A.; Trehan, S. *J. Org. Chem.*, **1998**, 63, 2365.

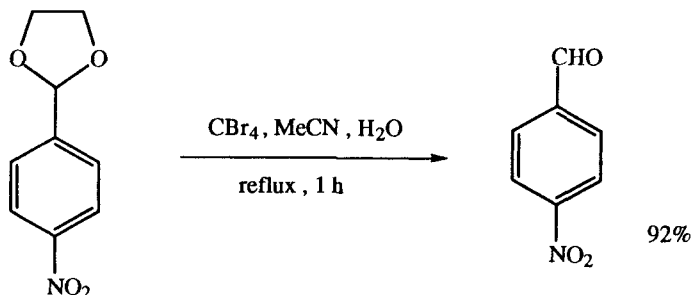


Clerici, A.; Pastori, N.; Porta, O. *Tetrahedron*, **1998**, 54, 15679.

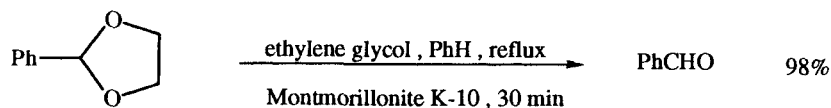




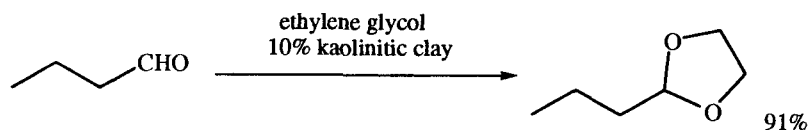
Meshram, H.M.; Reddy, G.S.; Yadav, J.S. *Tetrahedron Lett*, **1997**, 38, 8891.



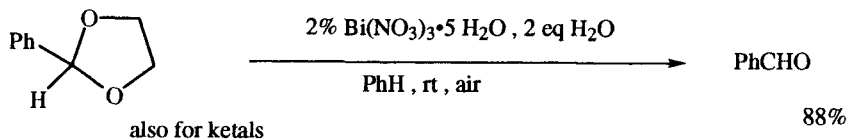
Lee, A.S.-Y.; Cheng, C.-L. *Tetrahedron*, **1997**, 53, 14255.



Li, T.-S.; Li, S.-H.; Li, J.-T.; Li, H.-Z. *J. Chem. Res. (S)*, **1997**, 26.



Ponde, D.; Borate, H.B.; Sudalai, A.; Ravindranathan, T.; Deshpande, V.H. *Tetrahedron Lett.*, **1996**, 37, 4605.



also for ketals

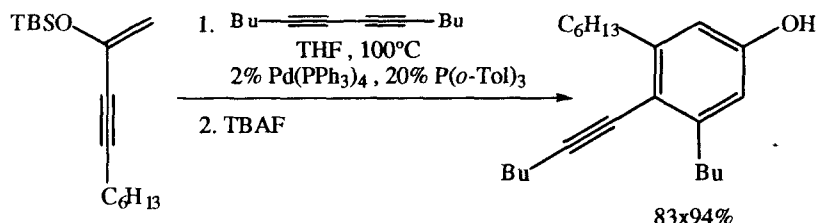
Komatsu, N.; Tankguchi, A.; Uda, M.; Suzuki, H. *Chem. Commun*, **1996**, 1847.

## CHAPTER 5

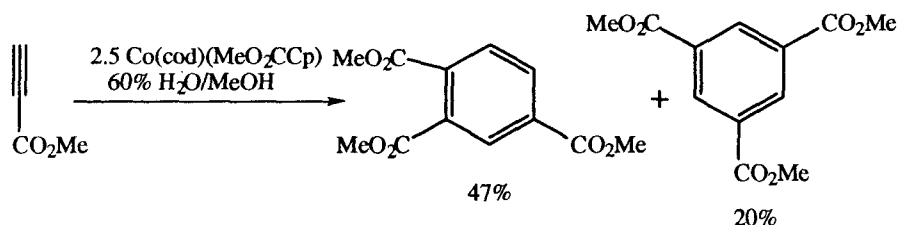
# PREPARATION OF ALKYL, METHYLENES AND ARYL

This chapter lists the conversion of functional groups into methyl, ethyl, propyl, etc. as well as methylene (CH<sub>2</sub>), phenyl, etc.

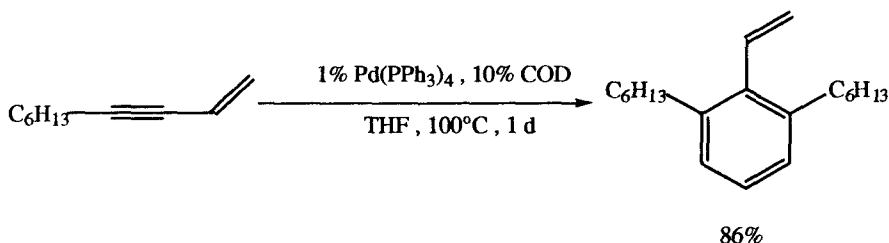
### SECTION 61: ALKYL, METHYLENES AND ARYL FROM ALKYNES



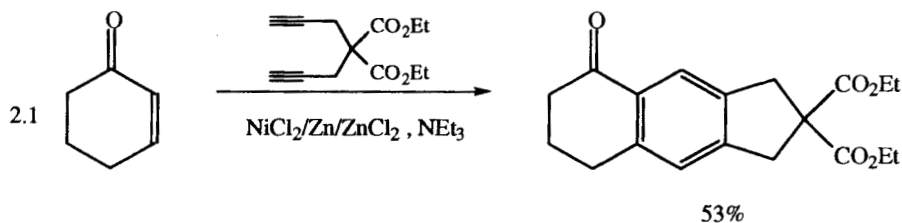
Gevorgyan, V.; Quan, L.G.; Yamamoto, Y. *J. Org. Chem.*, **1998**, 63, 1244.



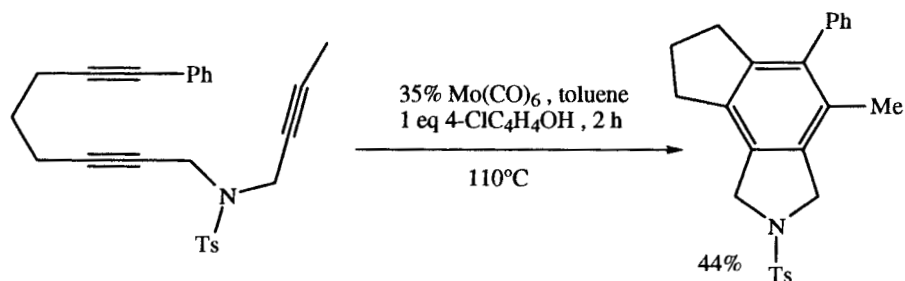
Sigman, M.S.; Fatland, A.W.; Eaton, B.E. *J. Am. Chem. Soc.*, **1998**, 120, 5130.



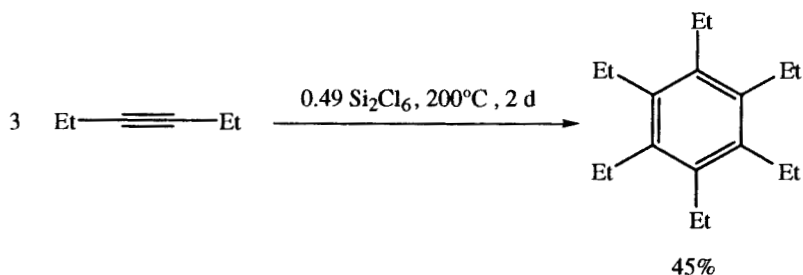
Gevorgyan, V.; Tando, K.; Uchiyama, N.; Yamamoto, Y. *J. Org. Chem.*, **1998**, 63, 7022.



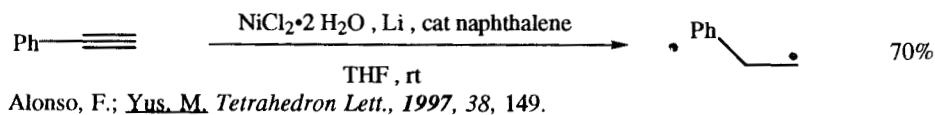
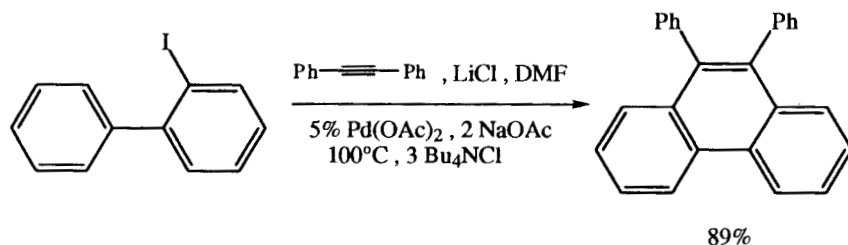
Ikeda, S.-i.; Watanabe, H.; Sato, Y. *J. Org. Chem.*, **1998**, 63, 7026.



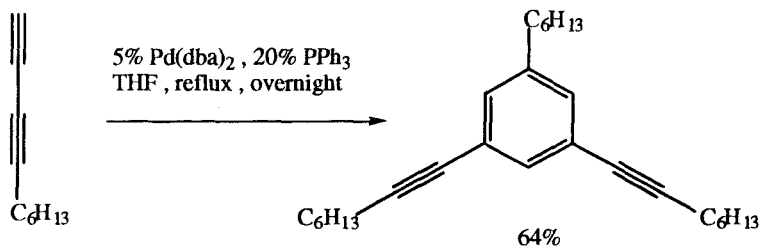
Nishida, M.; Shiga, H.; Mori, M. *J. Org. Chem.*, **1998**, 63, 8606.



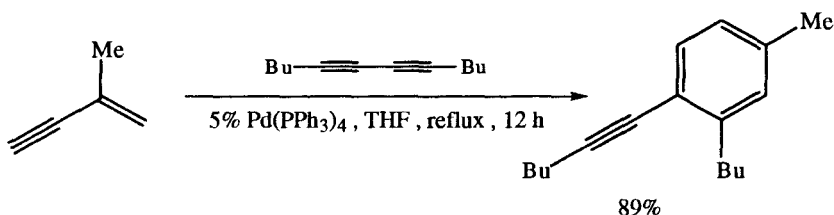
Yang, J.; Verkade, J.G. *J. Am. Chem. Soc.*, **1998**, 120, 6834.



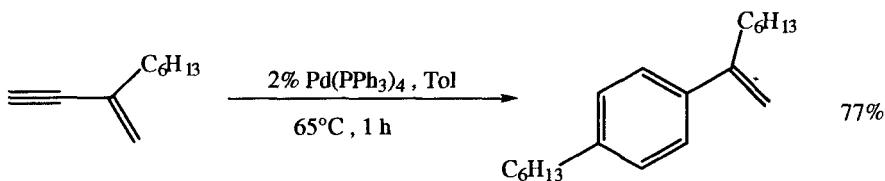




Takeda, A.; Ohno, A.; Kadota, I.; Gevorgyan, V.; Yamamoto, Y.  
*J. Am. Chem. Soc.*, **1997**, *119*, 4547.



Gevorgyan, V.; Takeda, A.; Yamamoto, Y. *J. Am. Chem. Soc.*, **1997**, *118*, 11313.



Saito, S.; Salter, M.M.; Gevorgyan, V.; Tsuboya, N.; Tando, K.; Yamamoto, Y.  
*J. Am. Chem. Soc.*, **1996**, *118*, 3970.

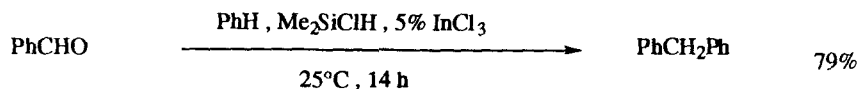
## SECTION 62: ALKYLs, METHYLENES AND ARYLs FROM ACID DERIVATIVES

NO ADDITIONAL EXAMPLES

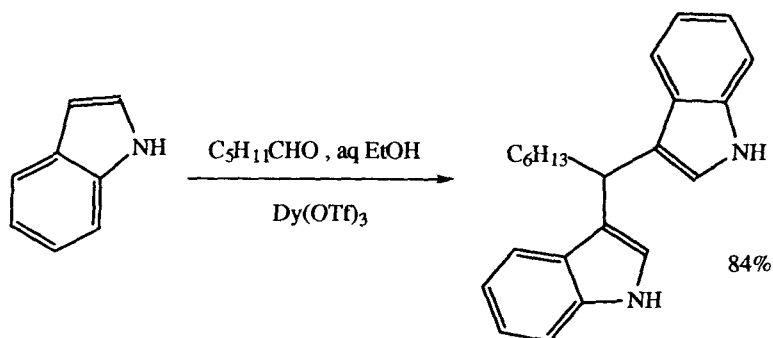
## SECTION 63: ALKYLs, METHYLENES AND ARYLs FROM ALCOHOLS AND THIOLS

NO ADDITIONAL EXAMPLES

## SECTION 64: ALKYL, METHYLENES AND ARYL FROM ALDEHYDES



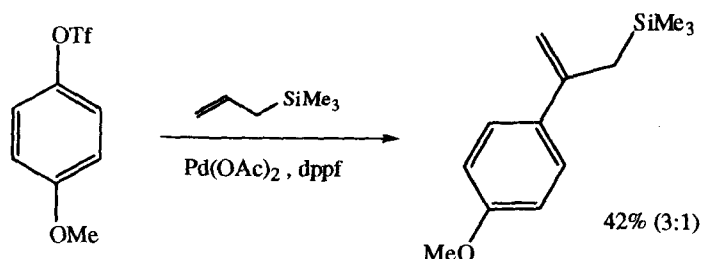
Miyami, T.; Onishi, Y.; Baba, A. *Tetrahedron Lett.*, **1998**, 39, 6291.



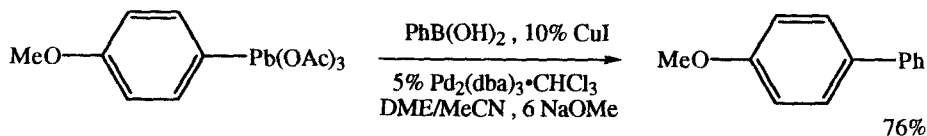
Chen, D.; Yu, L.; Wang, P.G. *Tetrahedron Lett.*, **1996**, 37, 4467.

Related Methods: Alkyls, Methylene and Aryls from Ketones (Section 72)

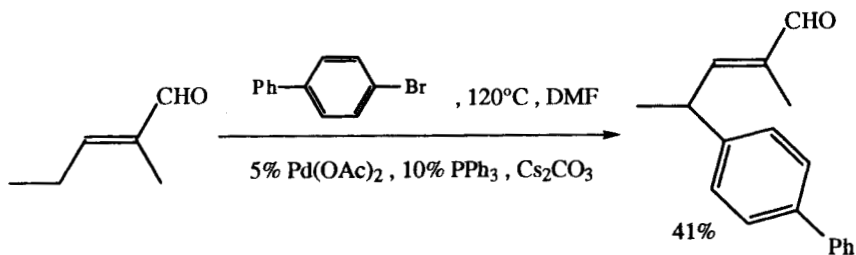
## SECTION 65: ALKYL, METHYLENES AND ARYL FROM ALKYL, METHYLENES AND ARYL



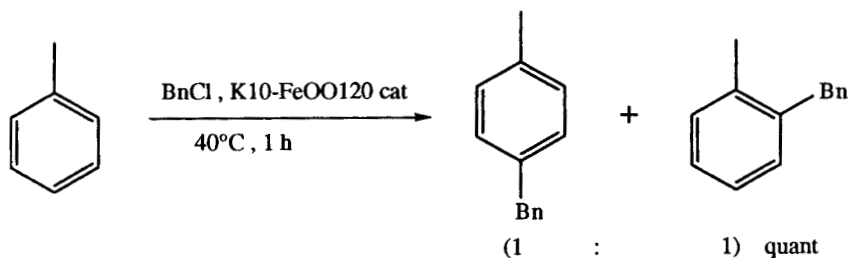
Olofsson, K.; Larhed, M.; Hallberg, A. *J. Org. Chem.*, **1998**, 63, 5076.



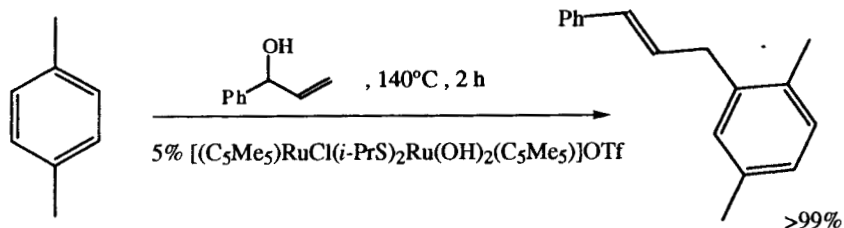
Kang, S.-K.; Ryu, H.-C.; Son, H.-J. *SynLett.*, **1998**, 771.



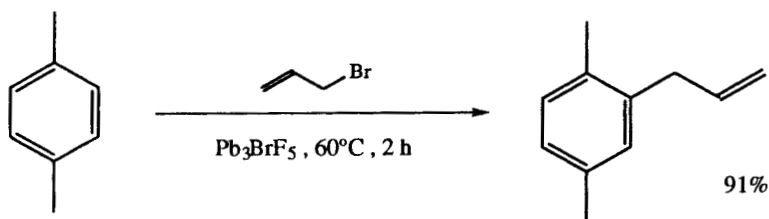
Terao, Y.; Satoh, T.; Miura, M.; Nomura, N.M. *Tetrahedron Lett.*, **1998**, 39, 6203.



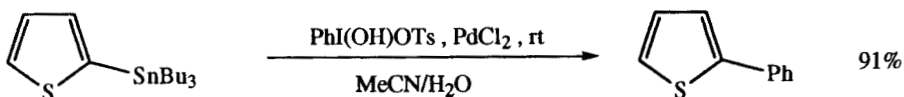
Pai, S.G.; Bajpai, A.R.; Deshpande, A.B.; Samant, S.D. *Synth. Commun.*, **1997**, 27, 2267.



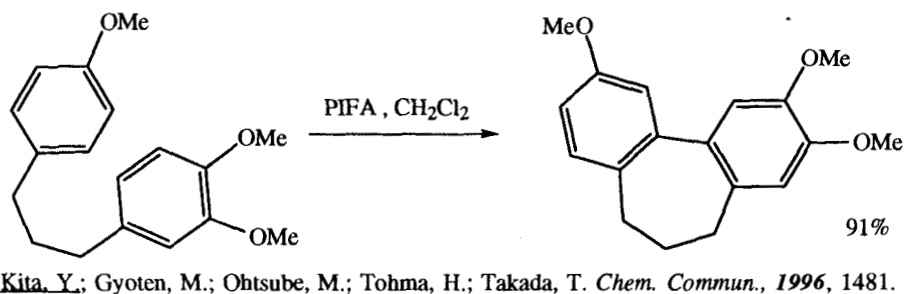
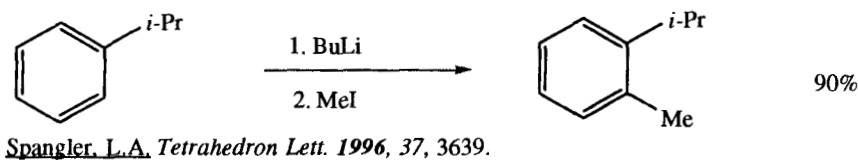
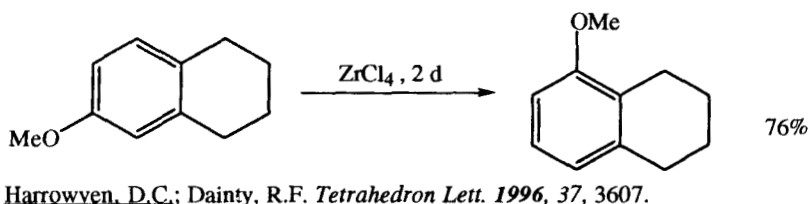
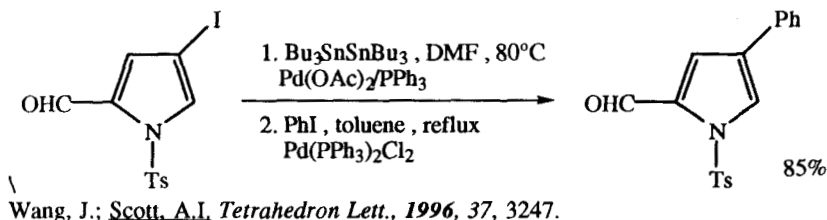
Nishibayashi, Y.; Yamanashi, M.; Takagi, Y.; Hidai, M. *Chem. Commun.*, **1997**, 859.



Ichihara, I. *Chem. Commun.*, **1997**, 1921.



Kang, S.-K.; Abe, H. *Tetrahedron Lett.*, **1996**, 37, 3717.



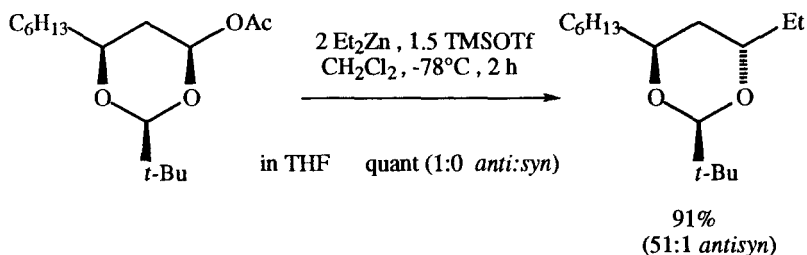
## SECTION 66: ALKYL, METHYLENES AND ARYL FROM AMIDES

NO ADDITIONAL EXAMPLES

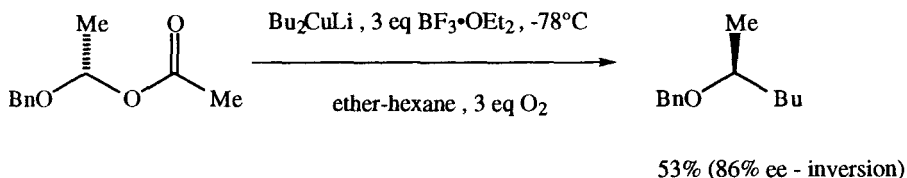
## SECTION 67: ALKYL, METHYLENES AND ARYL FROM AMINES

NO ADDITIONAL EXAMPLES

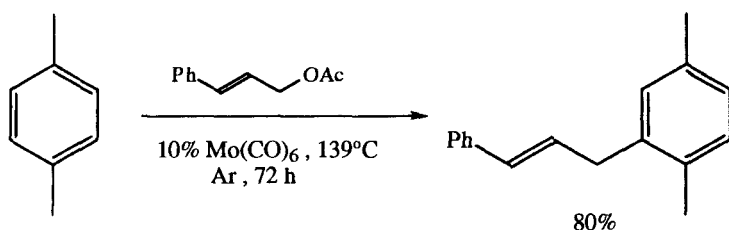
# SECTION 68: ALKYLs, METHYLENES AND ARYLs FROM ESTERS



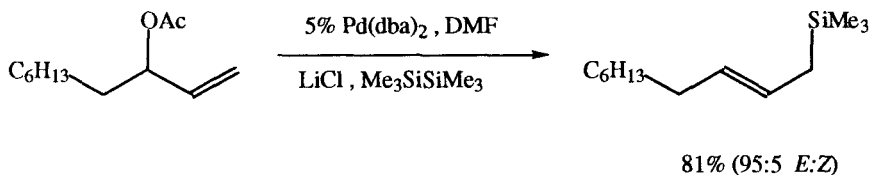
Rychnovsky, S.D.; Powell, N.A. *J. Org. Chem.*, **1997**, 62, 6460.



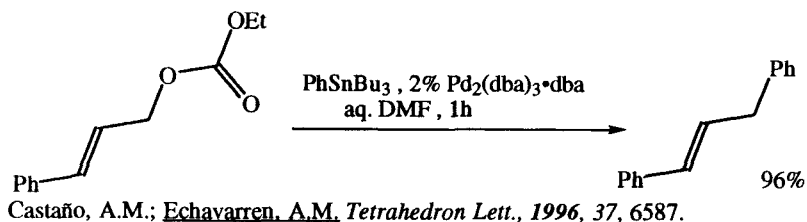
Matsutani, H.; Ichikawa, S.; Yarava, J.; Kusumoto, T.; Hiyama, T. *J. Am. Chem. Soc.*, **1997**, 119, 4541.



Shimizu, I.; Sakamoto, T.; Kwaragi, S.; Maruyama, Y.; Yamamoto, A. *Chem. Lett.*, **1997**, 137.

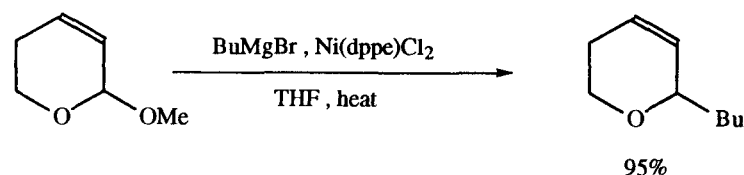


Tsuji, Y.; Funato, M.; Ozawa, M.; Ogiyama, H.; Kajita, S.; Kawamura, T. *J. Org. Chem.*, **1996**, 61, 5779.

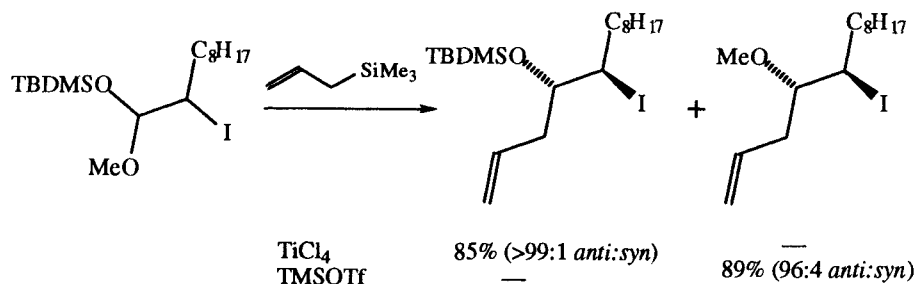


## SECTION 69: ALKYL, METHYLENES AND ARYL FROM ETHERS, EPOXIDES AND THIOETHERS

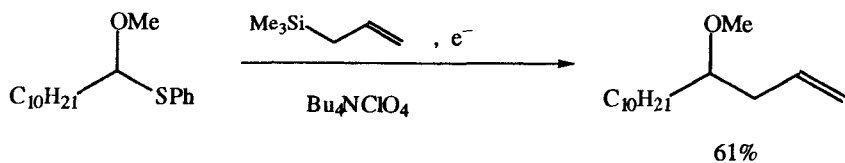
The conversion ROR → RR' (R' = alkyl, aryl) is included in this section.



Guagnano, V.; Lardicci, L.; Malanga, C.; Menicagli, R. *Tetrahedron Lett.*, **1998**, 39, 2025.



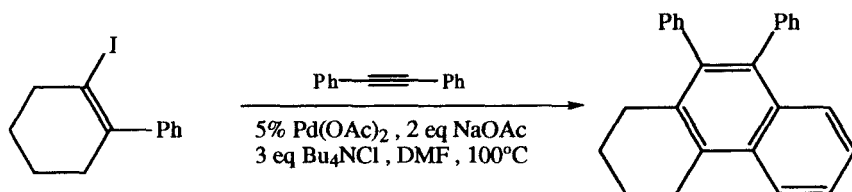
Maeda, K.; Shinokubo, H.; Oshima, K. *J. Org. Chem.*, **1997**, 62, 6425.



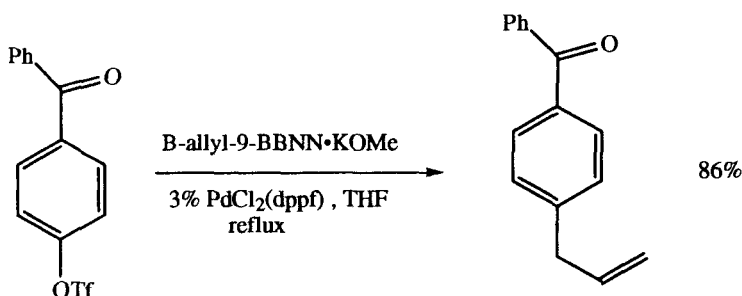
Yoshida, J.; Sugawara, M.; Kise, N. *Tetrahedron Lett.*, **1996**, 37, 3157.

## SECTION 70: ALKYLs, METHYLENES AND ARYLs FROM HALIDES AND SULFONATES

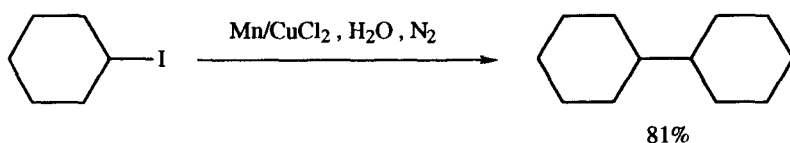
The replacement of halogen by alkyl or aryl groups is included in this section. For the conversion of  $RX \rightarrow RH$  ( $X = \text{halogen}$ ) see Section 160 (Hydrides from Halides and Sulfonates).



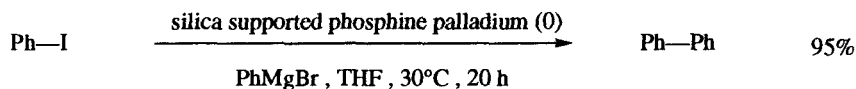
Larock, R.C.; Tian, Q. *J. Org. Chem.*, **1998**, 63, 2002.



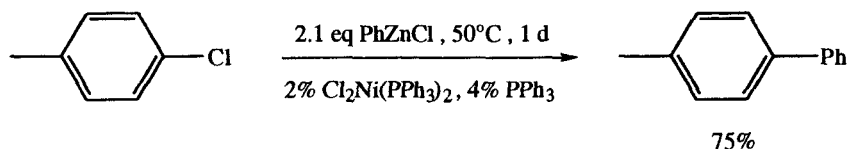
Fürstner, A.; Seidel, G. *SynLett*, **1998**, 161.



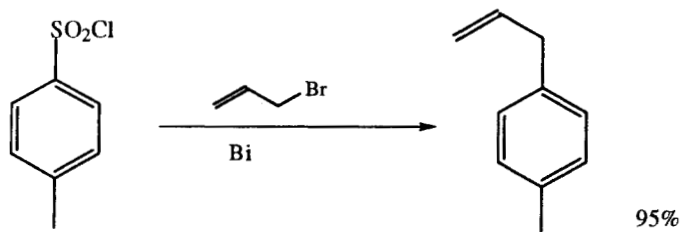
Ma, J.; Chan, T.-H. *Tetrahedron Lett.*, **1998**, 39, 2499.



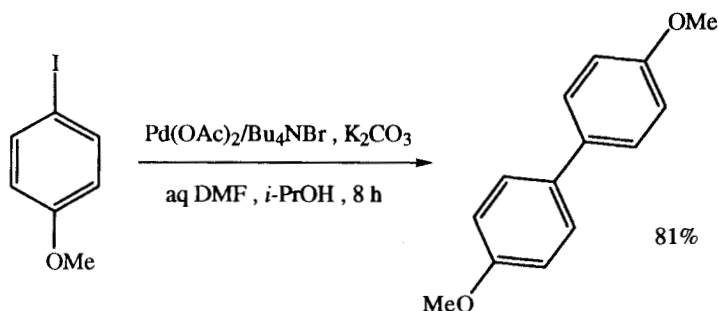
Cai, M.-Z.; Song, C.-S.; Huang, X. *J. Chem. Res. (S)*, **1998**, 264.



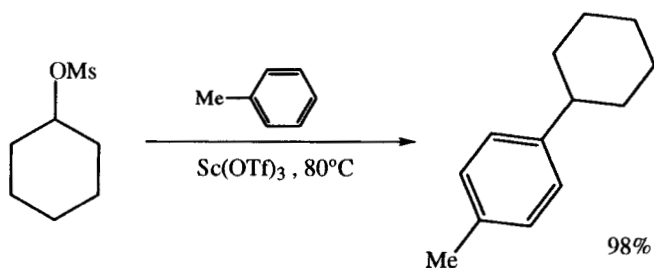
Miller, J.A.; Farrell, R.P. *Tetrahedron Lett.*, **1998**, 39, 6441.



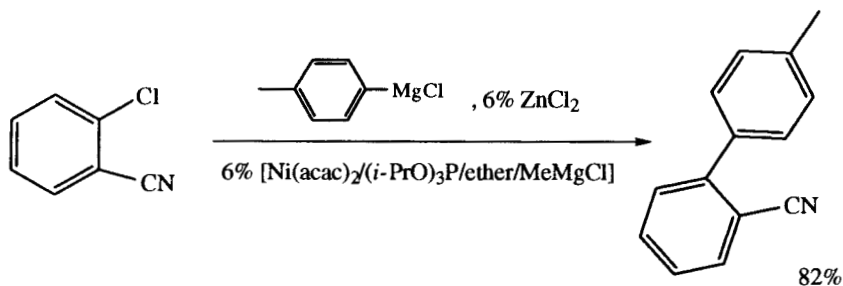
Baruah, M.; Boruah, A.; Prajapati, D.; Sandhu, J.S. *SynLett*, **1998**, 1083.



Penalva, V.; Hassan, J.; Lavenot, L.; Gozzi, C.; LeMaire, M. *Tetrahedron Lett.*, **1998**, 39, 2559

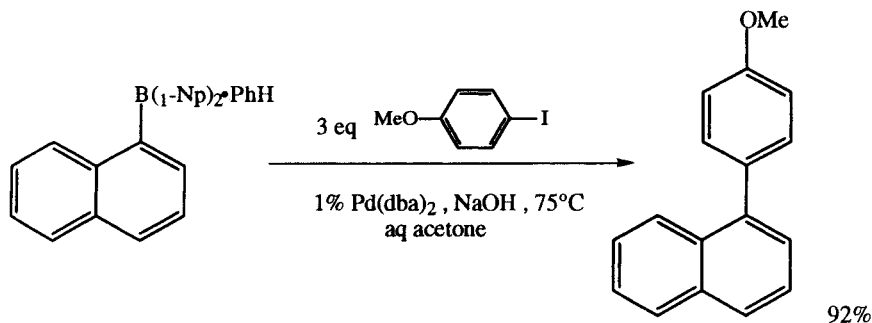


Kotsuki, H.; Oshisi, T.; Inoue, M. *SynLett*, **1998**, 255.

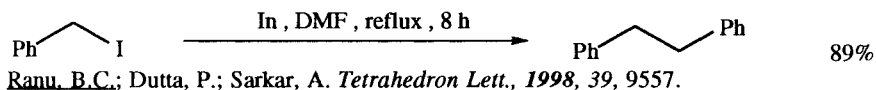


Miller, J.A.; Farrell, R.P. *Tetrahedron Lett*, **1998**, 39, 7275.

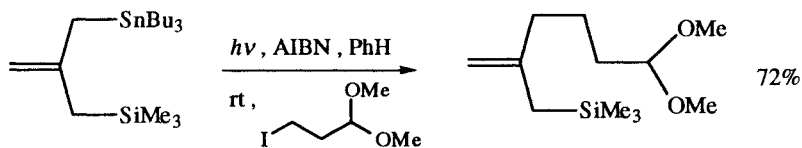




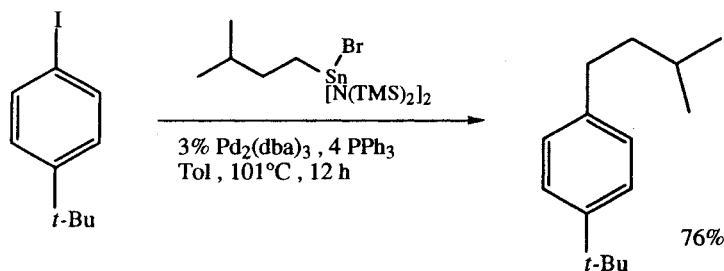
Bumagin, N.A.; Tsarev, D.A. *Tetrahedron Lett.*, **1998**, 39, 8155.



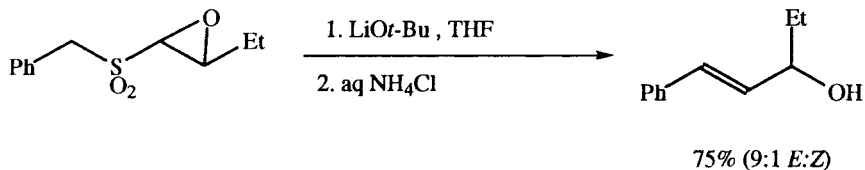
Ranu, B.C.; Dutta, P.; Sarkar, A. *Tetrahedron Lett.*, **1998**, 39, 9557.



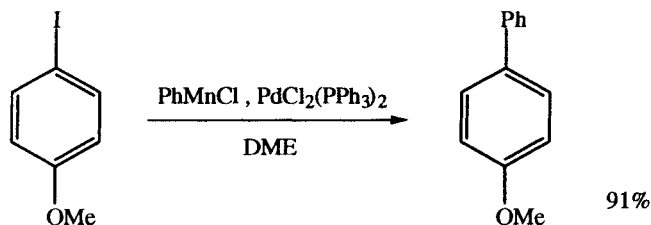
Clive, D.L.L.; Paul, C.C.; Wang, Z. *J. Org. Chem.*, **1997**, 62, 7028.



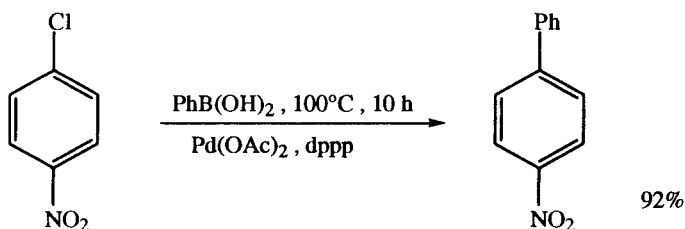
Fouquet, E.; Pereyre, M.; Rodriguez, A.L. *J. Org. Chem.*, **1997**, 62, 5242.



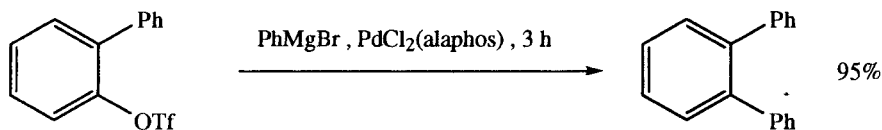
Berkowitz, W.F.; Wu, Y. *Tetrahedron Lett.*, **1997**, 38, 3171.



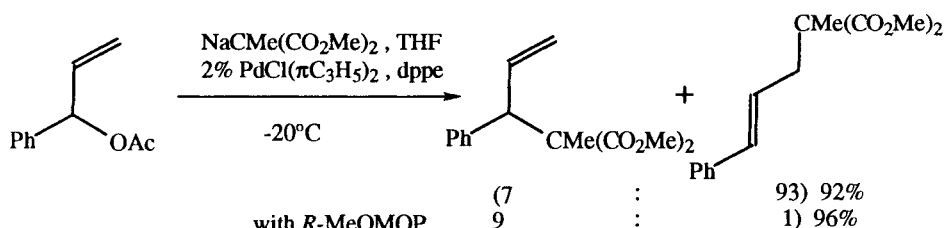
Riguet, E.; Alami, M.; Cabiez, G. *Tetrahedron Lett.*, **1997**, 38, 4397.



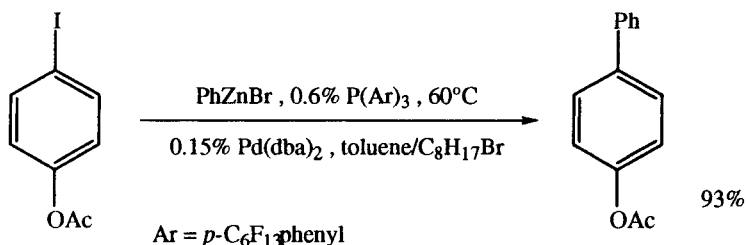
Shen, W. *Tetrahedron Lett.*, **1997**, 38, 5575.



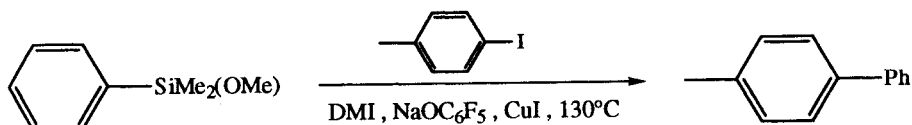
Kamikawa, T.; Hayashi, T. *SynLett*, **1997**, 163.



Hayashi, T.; Kawatsura, M.; Uozumi, Y. *Chem. Commun.*, **1997**, 561.



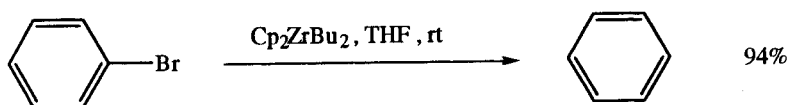
Betzemeier, B.; Knochel, P. *Angew. Chem. Int. Ed.*, **1997**, 36, 2623.



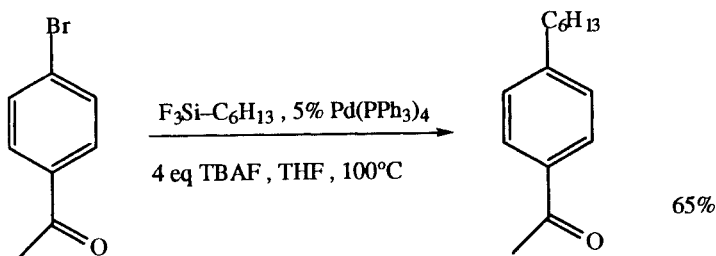
does not work well with all  $\text{SiR}_3$  derivatives

72%

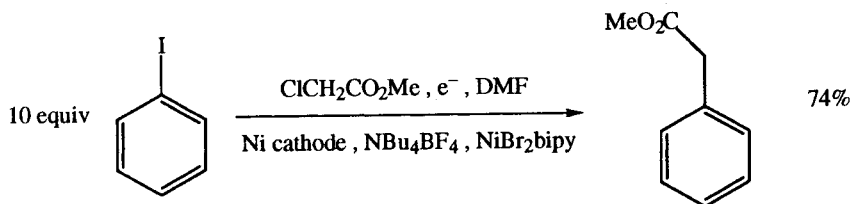
Ito, H.; Sensui, H.; Arimoto, K.; Miura, K.; Hosomi, A. *Chem. Lett.*, **1997**, 679.



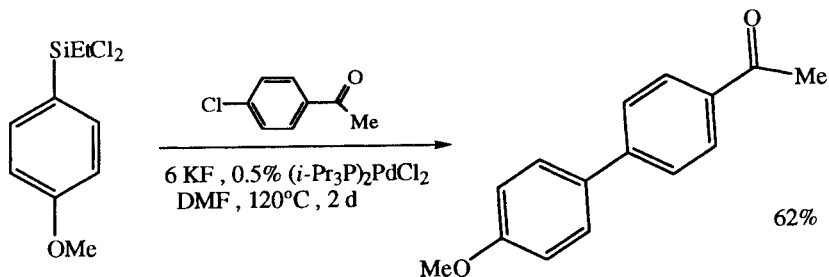
Hara, R.; Sun, W.-H.; Nishihara, Y.; Takahashi, T. *Chem. Lett.*, **1997**, 1251.



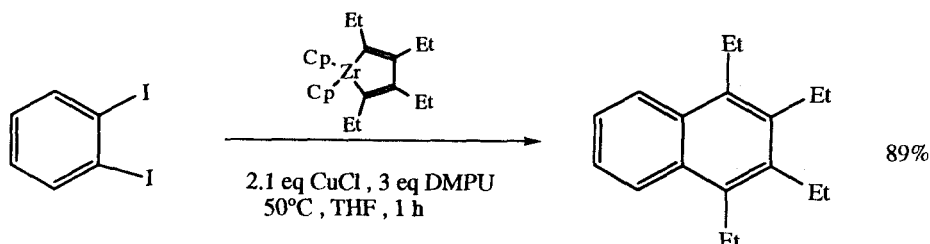
Matsubashi, H.; Asai, S.; Hirabayashi, K.; Hatanaka, Y.; Mori, A.; Hiyama, T. *Bull. Chem. Soc. Jpn.*, **1997**, 70, 437.



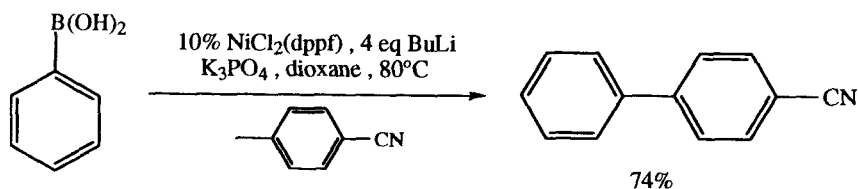
Durandetti, M.; Nédékec, J.-Y.; Périchon, J. *J. Org. Chem.*, **1996**, 61, 1748.



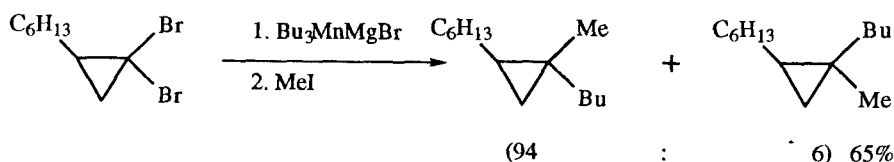
Gouda, K.; Hagiwara, E.; Hatanaka, Y.; Hiyama, T. *J. Org. Chem.*, **1996**, 61, 7232.



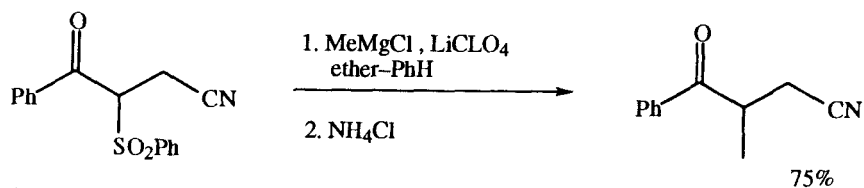
Takahashi, T.; Hara, R.; Nishihara, Y.; Kitora, M. *J. Am. Chem. Soc.*, **1996**, 118, 5154.



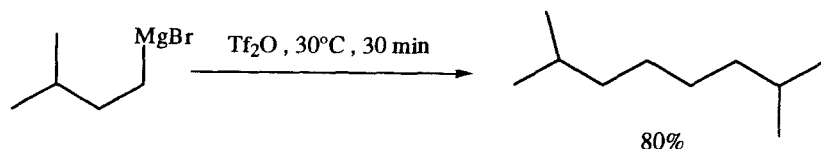
Saito, S.; Sakai, M.; Miyaura, N. *Tetrahedron Lett.*, **1996**, 37, 2993.



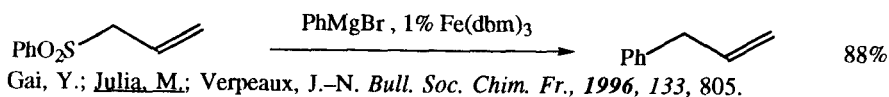
Inoue, R.; Shinokubo, H.; Oshima, K. *Tetrahedron Lett.*, **1996**, 37, 5377.



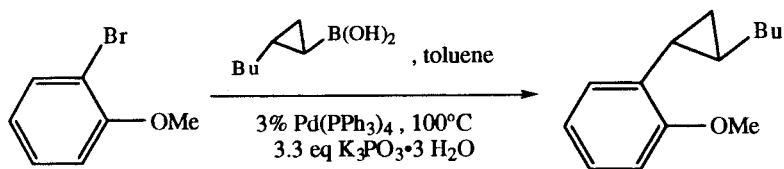
Giovannini, R.; Petrini, M. *SynLett.*, **1996**, 1001.



Nishiyama, T.; Seshita, T.; Shodai, H.; Aoki, K.; Kameyama, H.; Komura, K. *Chem. Lett.*, **1996**, 549.



Gai, Y.; Julia, M.; Verpeaux, J.-N. *Bull. Soc. Chim. Fr.*, **1996**, 133, 805.



89%

Wang, X.-Z.; Deng, M.-Z. *J. Chem. Soc., Perkin Trans. 1*, **1996**, 2663.

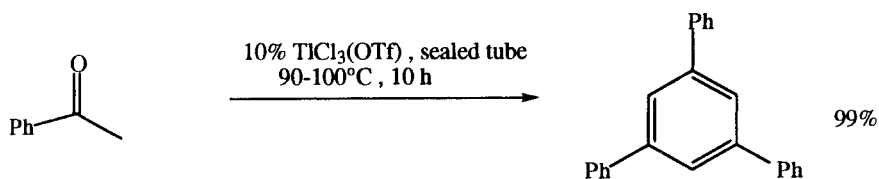
## SECTION 71: ALKYLs, METHYLENES AND ARYLs FROM HYDRIDES

This section lists examples of the reaction of  $\text{RH} \rightarrow \text{RR}'$  ( $\text{R}, \text{R}' = \text{alkyl or aryl}$ ). For the reaction  $\text{C}=\text{CH} \rightarrow \text{C}=\text{C}-\text{R}$  ( $\text{R} = \text{alkyl or aryl}$ ), see Section 209 (Alkenes from Alkenes). For alkylations of ketones and esters, see Section 177 (Ketones from Ketones) and Section 113 (Esters from Esters).

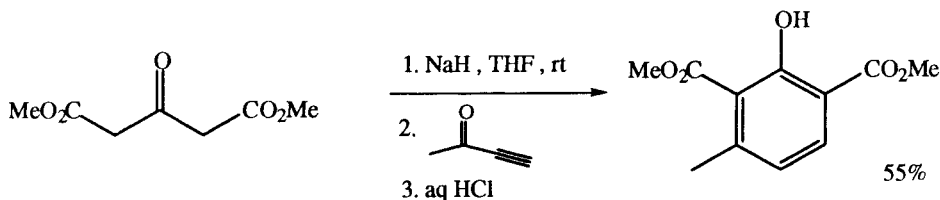
NO ADDITIONAL EXAMPLES

## SECTION 72: ALKYLs, METHYLENES AND ARYLs FROM KETONES

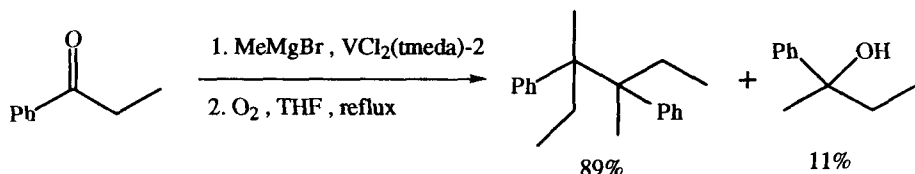
The conversions  $\text{R}_2\text{C}=\text{O} \rightarrow \text{R}-\text{R}$ ,  $\text{R}_2\text{CH}_2$ ,  $\text{R}_2\text{CHR}'$ , etc. are listed in this section.



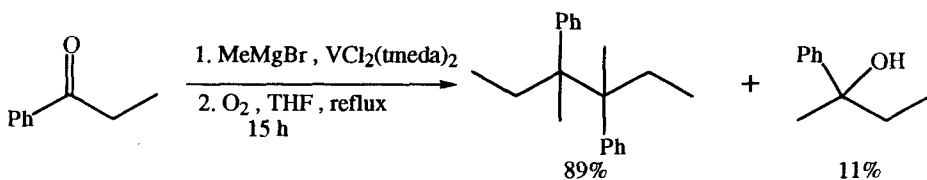
Iranpoor, N.; Zeynizaded, B. *SynLett*, **1998**, 1079.



Covarrubias-Zúñiga, A. *Synth. Commun.*, **1998**, 28, 1525.

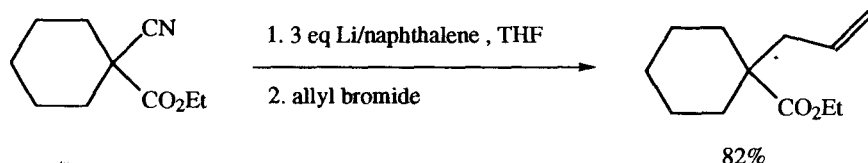


Kataoka, Y.; Akiyama, H.; Makihiro, I.; Tani, K. *J. Org. Chem.*, **1997**, 62, 8109.



Kataoka, Y.; Akiyama, H.; Makihiro, I.; Tani, K. *J. Org. Chem.*, **1996**, 61, 6094.

### SECTION 73 ALKYL, METHYLENES AND ARYL FROM NITRILES



Shia, R.-S.; Chang, N.-Y.; Yie, J.; Liu, H.-J. *Tetrahedron Lett.*, **1997**, 38, 7713.

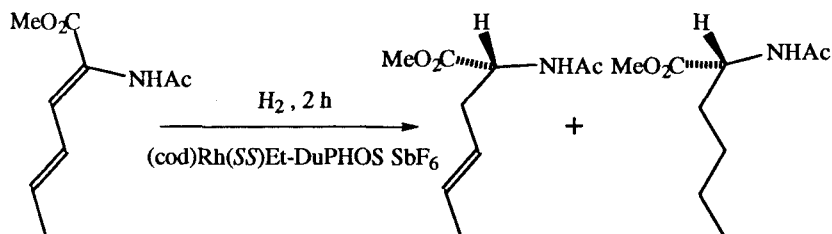
### SECTION 74: ALKYL, METHYLENES AND ARYL FROM ALKENES

The following reaction types are included in this section:

- Hydrogenation of Alkenes (and Aryls)
- Formation of Aryls
- Alkylations and Arylations of Alkenes
- Conjugate Reduction of Conjugated Aldehydes, Ketones, Acids, Esters and Nitriles
- Conjugate Alkylations
- Cyclopropanations, including halocyclopropanations

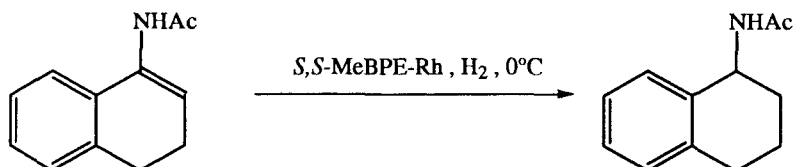
#### SECTION 74A: Hydrogenation of Alkenes (and Aryls)

Reduction of aryls to dienes are listed in Section 377 (Alkene-Alkene).



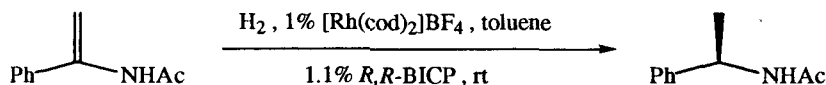
(200  
(99.2% ee, S) : 1) quant

Burk, M.J.; Allen, J.G.; Kiesman, W.F. *J. Am. Chem. Soc.*, **1998**, *120*, 657.



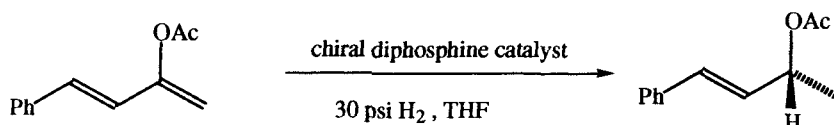
92% ee

Burk, M.J.; Casy, G.; Johnson, N.B. *J. Org. Chem.*, **1998**, *63*, 6084.



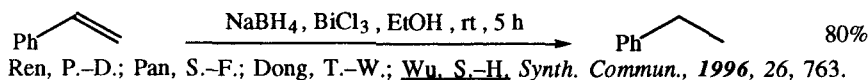
86% ee

Zhu, G.; Zhang, X. *J. Org. Chem.*, **1998**, *63*, 9590.



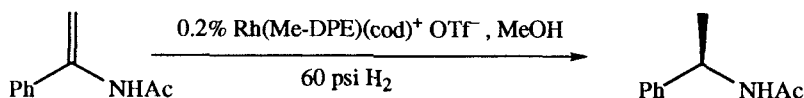
94% ee

Boaz, N.W. *Tetrahedron Lett.*, **1998**, *39*, 5505.



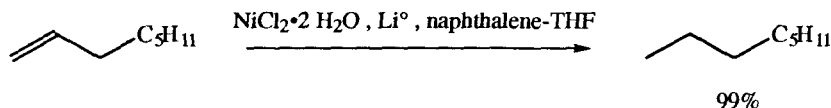
80%

Ren, P.-D.; Pan, S.-F.; Dong, T.-W.; Wu, S.-H. *Synth. Commun.*, **1996**, *26*, 763.

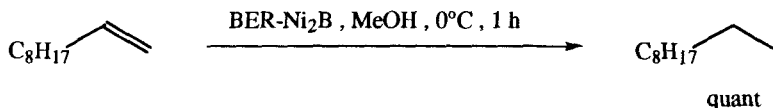


95% ee, R

Me-DPE = 1,2-bis(trans-2,5-dimethylphospholano)ethane  
Burk, M.J.; Wang, Y.M.; Lee, J.R. *J. Am. Chem. Soc.*, **1996**, *118*, 5142.



Alonso, F.; Yus, M. *Tetrahedron Lett.*, **1996**, 37, 6925.

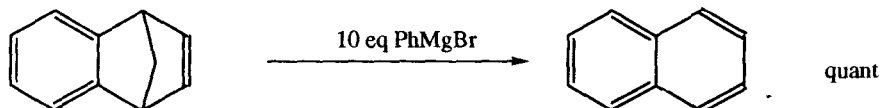


Choi, J.; Yoon, N.M. *Synthesis*, **1996**, 597.

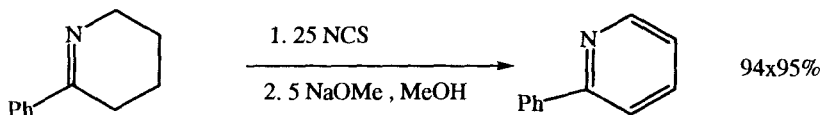
#### REVIEW:

"Asymmetric Transfer Hydrogenation Catalyzed by Chiral Ruthenium Complexes."  
Noyori, R.; Haseguchi, S. *Accts. Chem. Res.*, **1997**, 30, 97.

#### SECTION 74B: Formation of Aryls

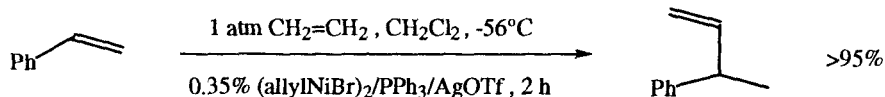


Blank, D.H.; Gribble, G.W. *Tetrahedron Lett.*, **1997**, 38, 4761.

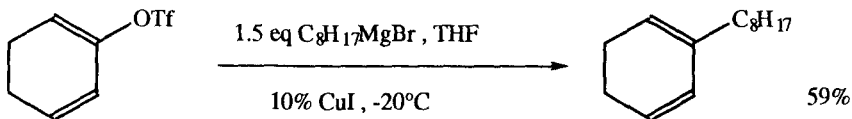


DeKimpe, N.; Keppens, M.; Fonck, G. *Chem. Commun.*, **1996**, 635.

#### SECTION 74C: Alkylations and Arylations of Alkenes

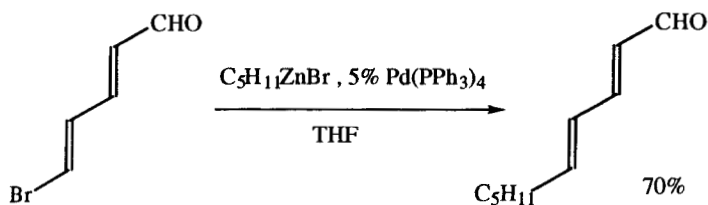


Nomura, N.; Jin, J.; Park, H.; Rajanbabu, J.V. *J. Am. Chem. Soc.*, **1998**, 120, 459.

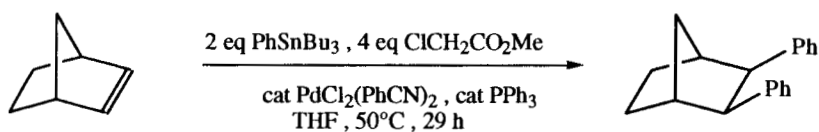


Karlström, A.S.E.; Rönn, M.; Thorarensen, A.; Bäckvall, J.-E. *J. Org. Chem.*, **1998**, 63, 2517

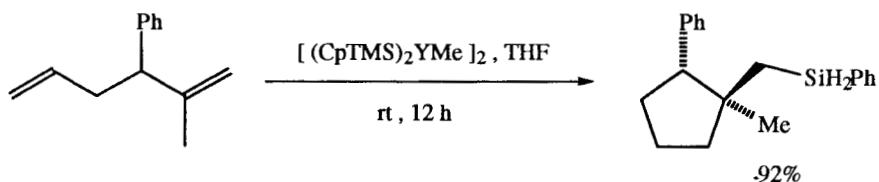




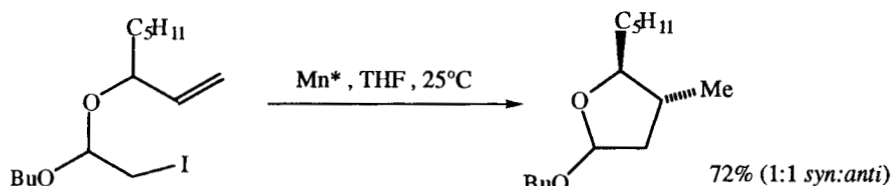
Vicart, N.; Castet-Caillabet, D.; Ramondency, Y.; Plé, G.; Cuhamel, L. *SynLett*, **1998**, 411



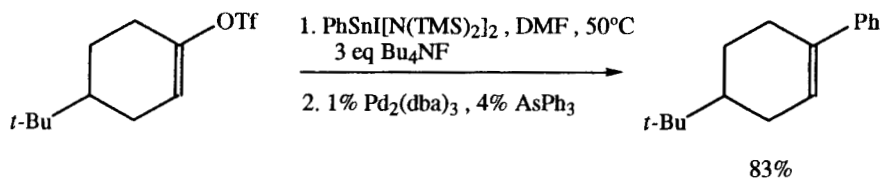
Fugami, K.; Hagiwara, S.; Oda, H.; Kosugi, M. *SynLett*, **1998**, 477.



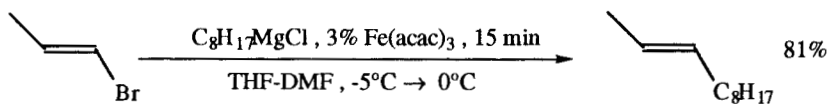
Molander, G.A.; Dowdy, E.D.; Schummann, H. *J. Org. Chem.*, **1998**, 63, 3386.



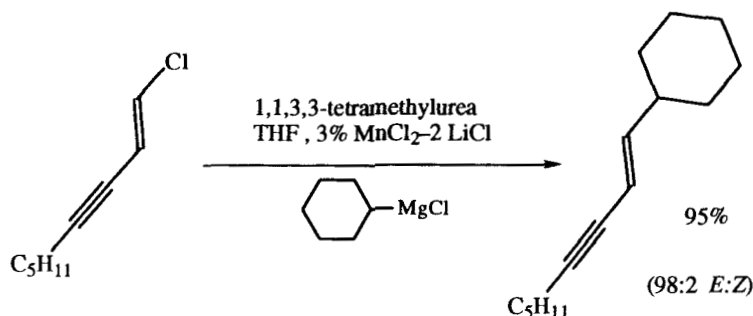
Tang, J.; Shinokubo, H.; Oshima, K. *SynLett*, **1998**, 1075.



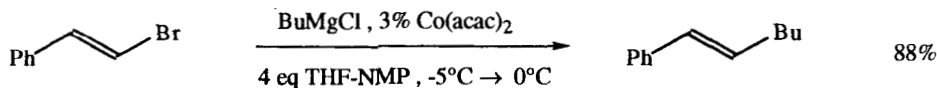
Fouquet, E.; Rodriguez, A.L. *SynLett*, **1998**, 1323.



Cahiez, G.; Avedissian, H. *Synthesis*, **1998**, 1199.

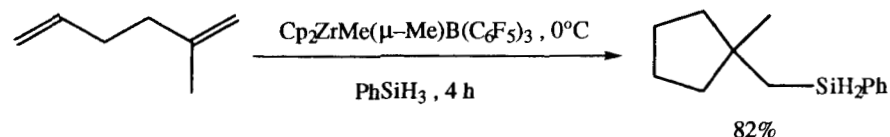


Alami, M.; Ramiandrasoa, P.; Cahiez, G. *SynLett*, **1998**, 325.

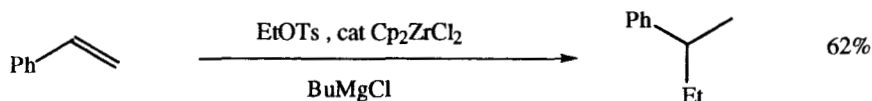


Cahiez, G.; Avedissian, H. *Tetrahedron Lett.*, **1998**, 39, 6159.

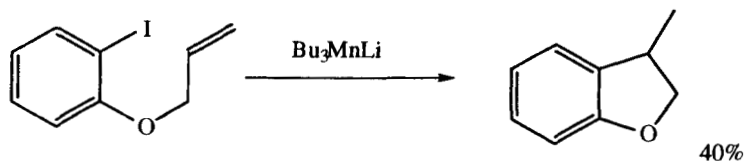
Avedissian, H.; Bérillon, L.; Cahiez, G.; Knochel, P. *Tetrahedron Lett.*, **1998**, 39, 6163 (with R-Zn derivatives).



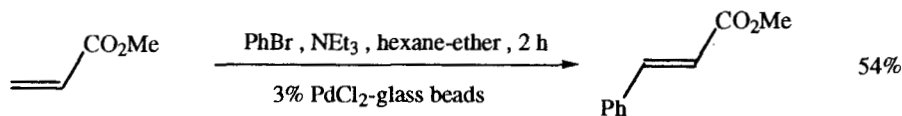
Molander, G.A.; Corrette, C.P. *Tetrahedron Lett.*, **1998**, 39, 5011.



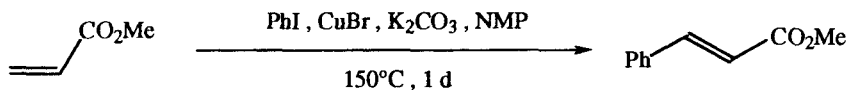
Terao, J.; Watanabe, T.; Saito, K.; Kambe, N.; Sonoda, N. *Tetrahedron Lett.*, **1998**, 39, 9201.



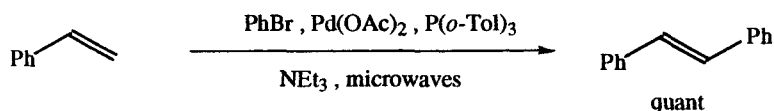
Nakao, J.; Inoue, R.; Shinokubo, H.; Oshima, K. *J. Org. Chem.*, **1997**, 62, 1910.



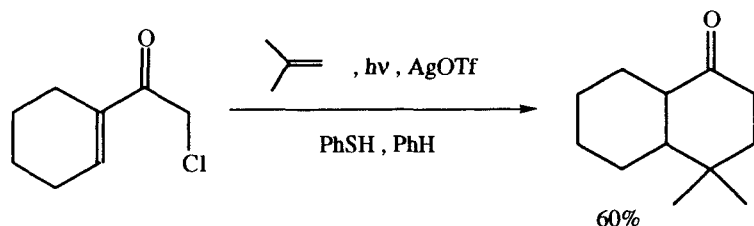
Tonks, L.; Anson, M.S.; Hellgardt, K.; Mirza, A.R.; Thompson, D.F.; Williams, J.M.J. *Tetrahedron Lett.*, **1997**, 38, 4319.



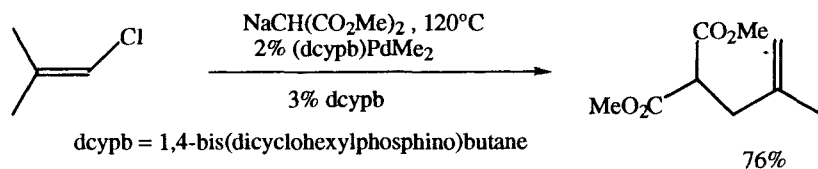
Iyer, S.; Ramesh, C.; Sarkar, A.; Wadgaonkar, P.P. *Tetrahedron Lett.*, **1997**, 38, 8113.



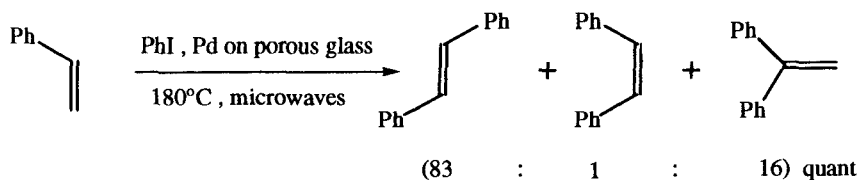
Díaz-Ortiz, Á.; Prieto, P.; Vázquez, E. *SynLett*, **1997**, 269.



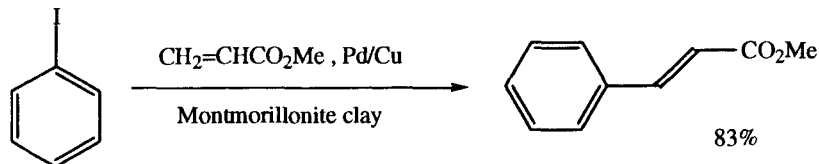
Sawayanagi, Y.; Sato, T.; Shimizu, I. *Chem. Lett.*, **1997**, 843.



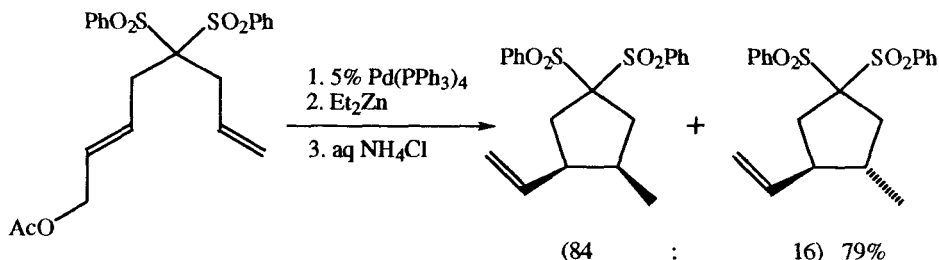
Reetz, M.T.; Wanninger, K.; Hermes, M. *Chem. Commun.*, **1997**, 535.



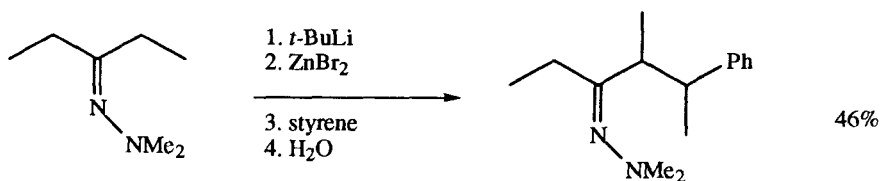
Li, J.; Mau, A.W.-H.; Strauss, C.R. *Chem. Commun.*, **1997**, 1275.



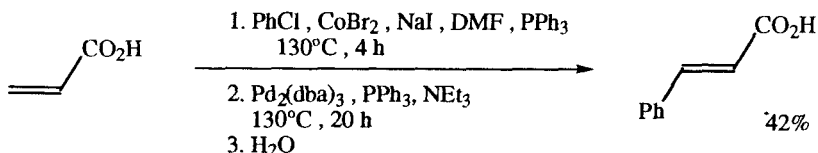
Ramchandani, R.K.; Uphade, B.S.; Vinod, M.P.; Wakharkar, R.D.; Choudhary, V.R.; Sudalai, A. *Chem. Commun.*, **1997**, 2071.



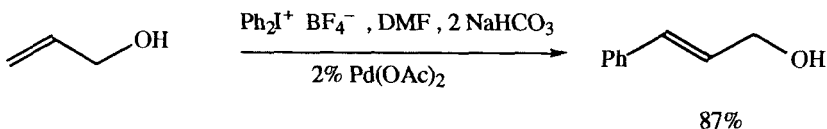
Oppolzer, W.; Schröder, F.; Kahl, S. *Helv. Chim. Acta*, **1997**, *80*, 2047.



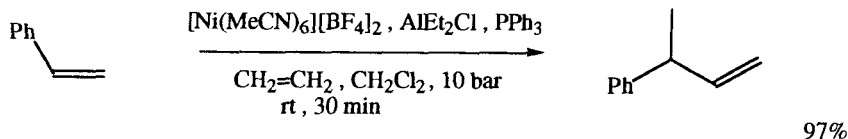
Kubota, K.; Nakamura, E. *Angew. Chem. Int. Ed.*, **1997**, *36*, 2491.



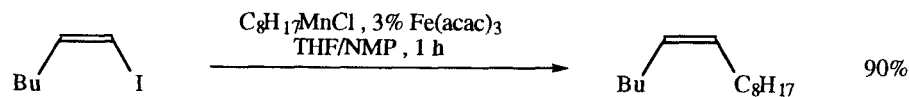
Mitra, J.; Mitra, A.K. *J. Indian Chem. Soc.*, **1997**, *74*, 146.



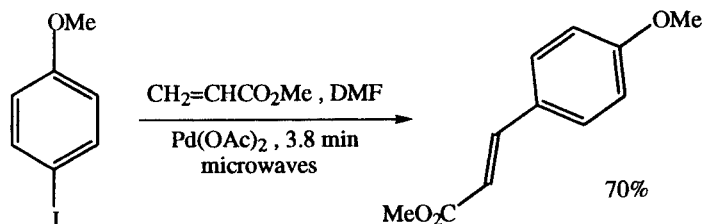
Kang, S.-K.; Lee, H.-W.; Jang, S.B.; Kim, T.-H.; Pyun, S.-J. *J. Org. Chem.*, **1996**, *61*, 2604



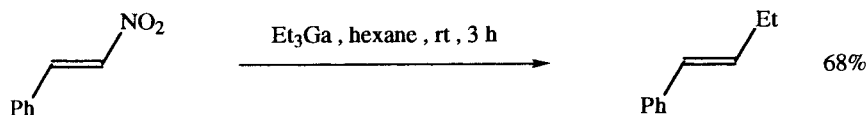
Monteiro, A.L.; Seferin, M.; Dupont, J.; de Souza, R.F. *Tetrahedron Lett.*, **1996**, *37*, 1157.



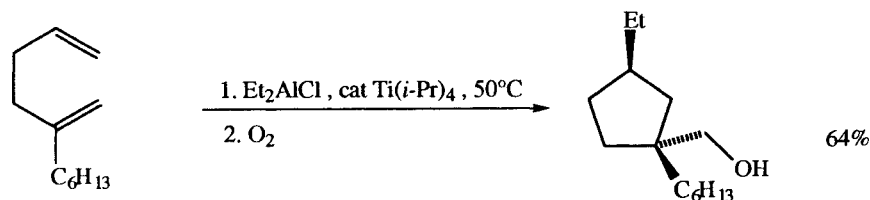
Cabiez, G.; Marquais, S. *Tetrahedron Lett.*, **1996**, *37*, 1773.



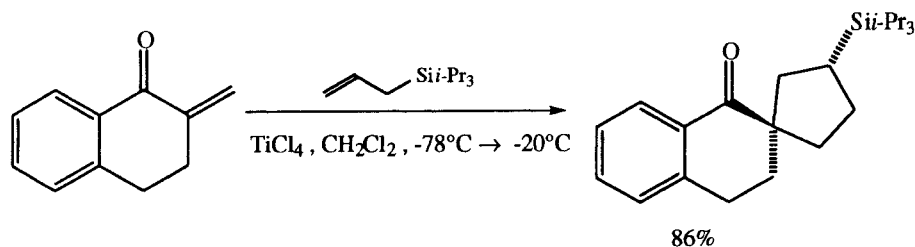
Larhed, M.; Hallberg, A. *J. Org. Chem.*, **1996**, 61, 9582.



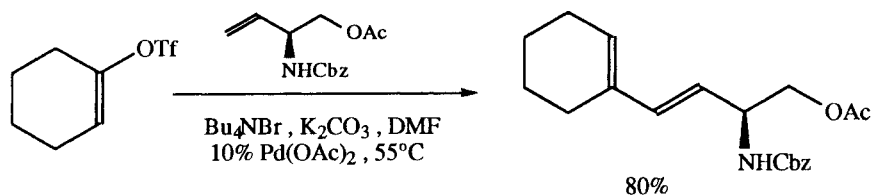
Han, Y.; Huang, Y.-Z.; Zhou, C.-M. *Tetrahedron Lett.*, **1996**, 37, 3347.



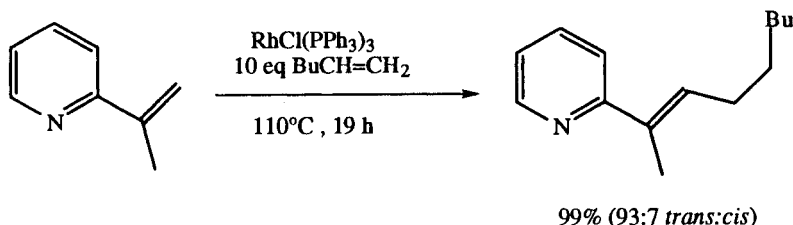
Kondakov, D.Y.; Wang, S.; Negishi, E. *Tetrahedron Lett.*, **1996**, 37, 3803.



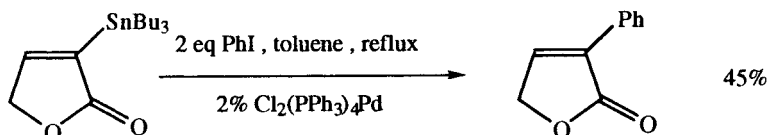
Knölkner, H.-J.; Jones, P.G.; Graf, R. *SynLett*, **1996**, 1155.



Crisp, G.T.; Gebauer, M.G. *Tetrahedron*, **1996**, 52, 12465.

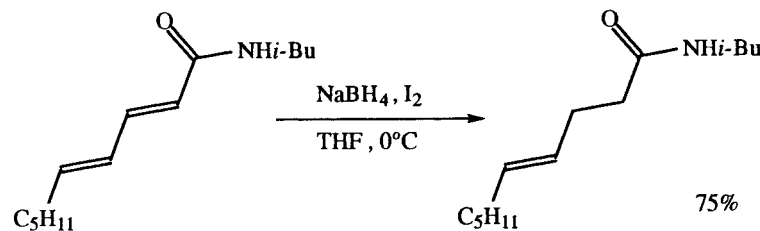


Lim, Y.-G.; Kang, J.-B.; Kim, Y.H. *Chem. Commun.*, **1996**, 585.

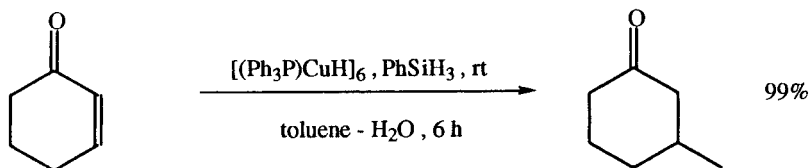


Holingsworth, G.J.; Perkins, G.; Sweeney, J. *J. Chem. Soc., Perkin Trans. 1*, **1996**, 1913.

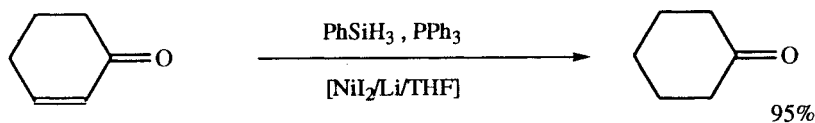
#### SECTION 74D: Conjugate Reduction of $\alpha,\beta$ -Unsaturated Carbonyl Compounds and Nitriles



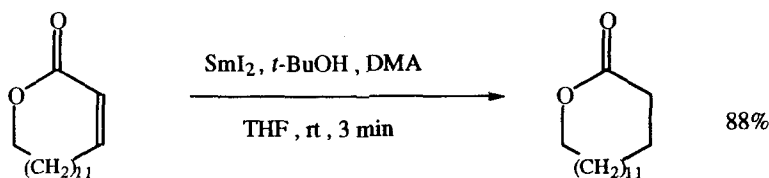
Das, B.; Kashinatham, A.; Madhusudhan, P. *Tetrahedron Lett.*, **1998**, 39, 677.



Lipshutz, B.H.; Keith, J.; Papa, P.; Vivian, R. *Tetrahedron Lett.*, **1998**, 39, 4627.

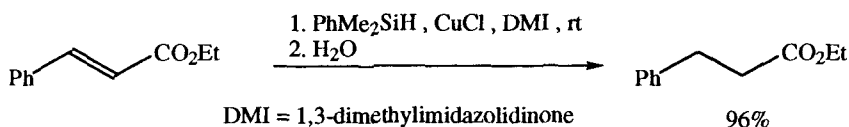


Boudjouk, P.; Choi, S.-B.; Hauck, B.J.; Rajkumar, A.B. *Tetrahedron Lett.*, **1998**, 39, 3951.



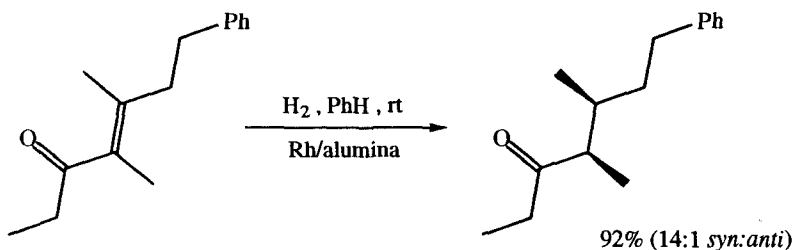
does not work with 6-membered ring lactones

Fujita, Y.; Fukuzumi, S.; Otera, J. *Tetrahedron Lett.*, **1997**, 38, 2121.

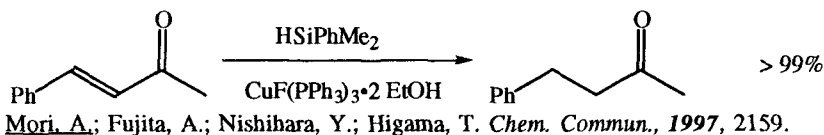


DMI = 1,3-dimethylimidazolidinone

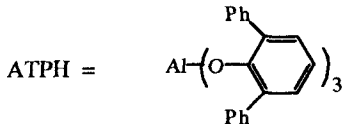
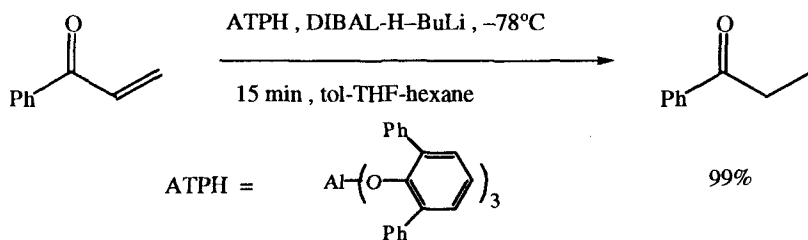
Ito, H.; Ishizuka, T.; Arimoto, K.; Miura, K.; Hosomi, A. *Tetrahedron Lett.*, **1997**, 38, 8887



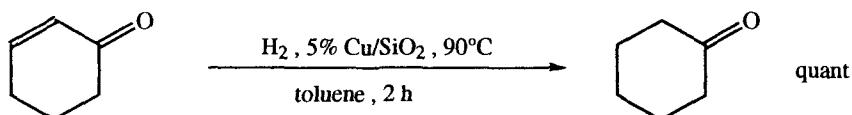
Yamaguchi, M.; Nitta, A.; Reddy, R.S.; Hirama, M. *SynLett*, **1997**, 117.



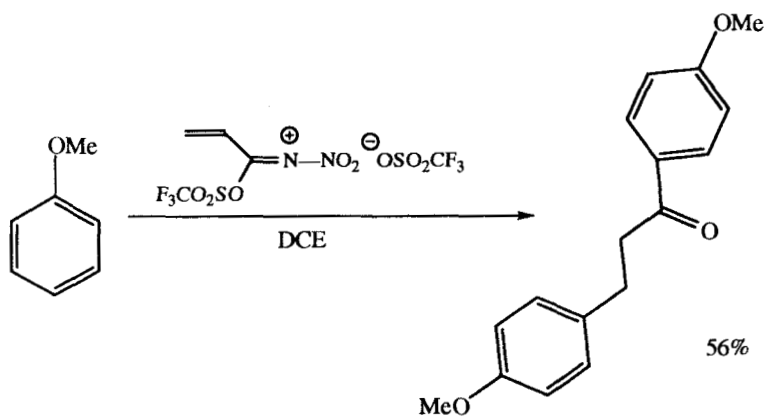
Mori, A.; Fujita, A.; Nishihara, Y.; Higama, T. *Chem. Commun.*, **1997**, 2159.



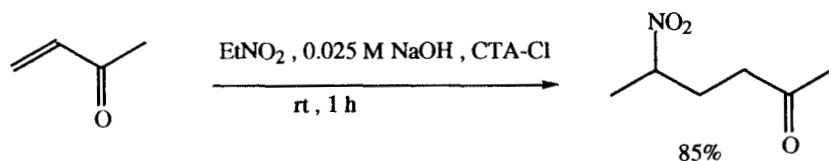
Saito, S.; Yamamoto, H. *J. Org. Chem.*, **1996**, 61, 2928.



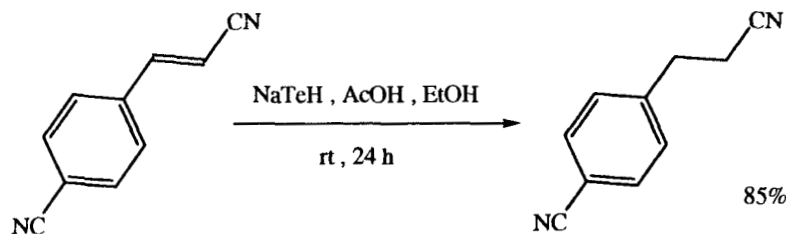
Ravasio, N.; Antenori, M.; Gargano, M.; Mastroiilli, P. *Tetrahedron Lett.*, **1996**, 37, 3529.



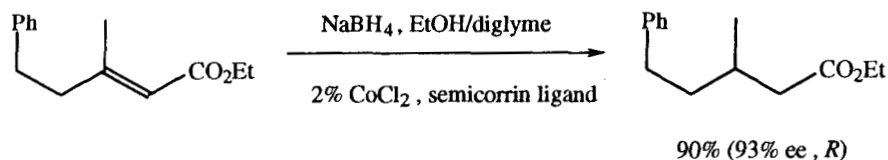
Nenajdenko, V.G.; Baraznenok, I.L.; Balenkova, E.S. *Tetrahedron Lett.*, **1996**, 37, 4199.



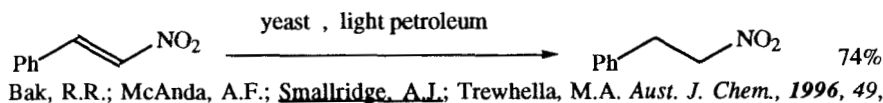
Ballini, R.; Boscia, G. *Tetrahedron Lett.*, **1996**, 37, 8027.



Blay, G.; Cardona, L.; García, B.; Lahoz, L.; Pedro, J.R. *Tetrahedron*, **1996**, 52, 8611.



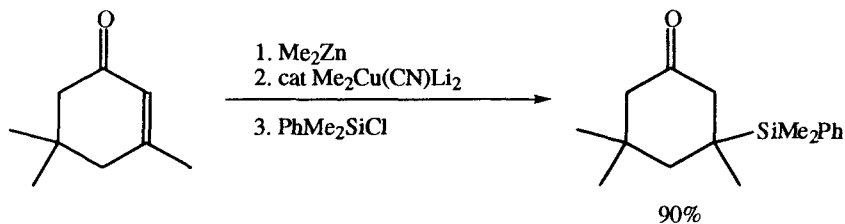
Misun, M.; Pfaltz, A. *Helv. Chim. Acta*, **1996**, 79, 961.



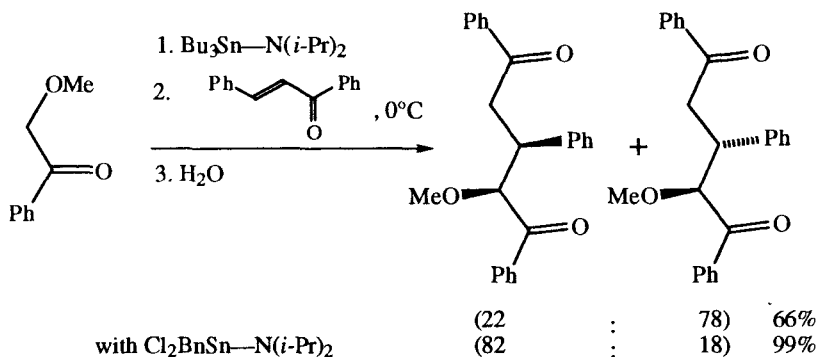
Bak, R.R.; McAnda, A.F.; Smallridge, A.J.; Trehwella, M.A. *Aust. J. Chem.*, **1996**, 49, 1257



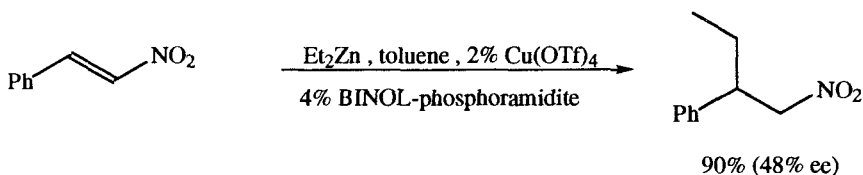
## SECTION 74E: Conjugate Alkylations



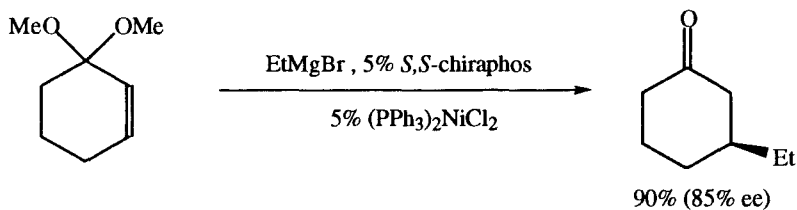
Lipshutz, B.H.; Sclafani, J.A.; Takanami, T. *J. Am. Chem. Soc.*, **1998**, 120, 4021.



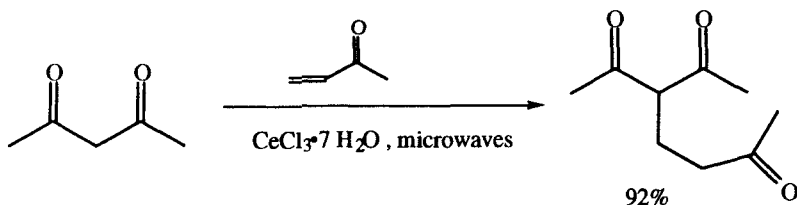
Shibata, I.; Yasuda, K.; Tanaka, Y.; Yasuda, M.; Baba, A. *J. Org. Chem.*, **1998**, 63, 1334.



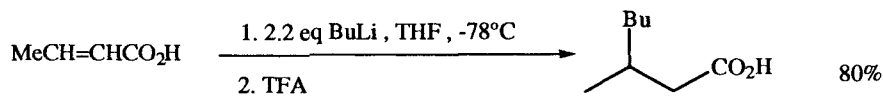
Sewald, N.; Wendisch, V. *Tetrahedron Asymmetry*, **1998**, 9, 1341.



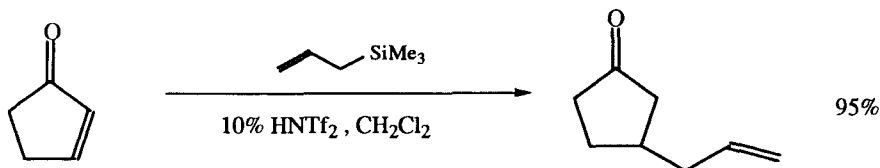
Gomez-Bengoa, E.; Heron, N.M.; Didiuk, M.T.; Luchaco, C.A.; Hoveyda, A.H. *J. Am. Chem. Soc.*, **1998**, 120, 7649.



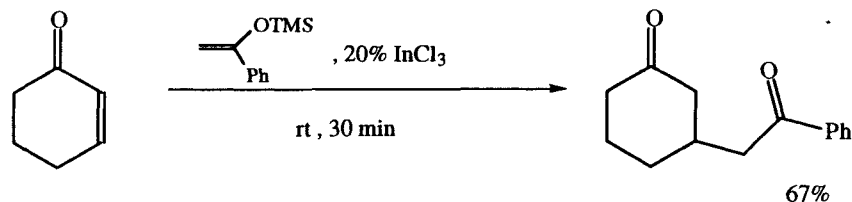
Boruah, A.; Baruah, M.; Prajapati, D.; Sandhu, J.S. *Synth. Commun.*, **1998**, 28, 653.



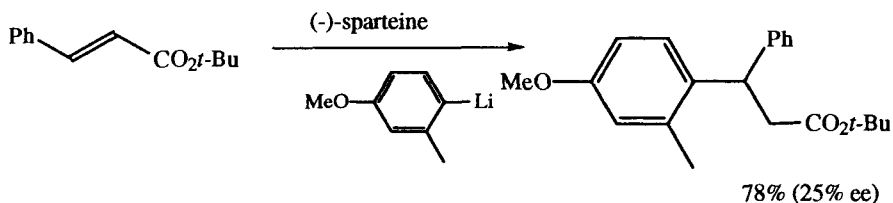
Plunian, B.; Vaultier, M.; Mortier, J. *Chem. Commun.*, **1998**, 81.



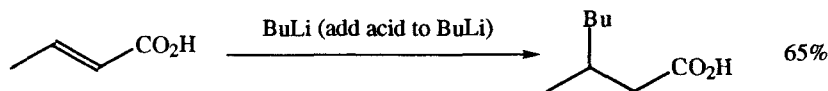
Kuhnert, N.; Peverley, J.; Robertson, J. *Tetrahedron Lett.*, **1998**, 39, 3215.



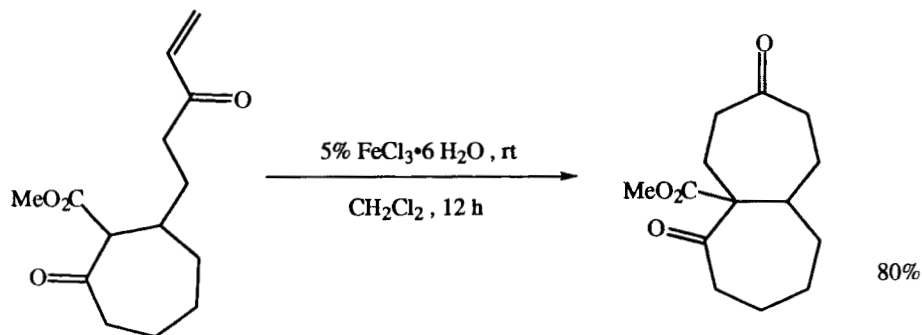
Loh, T.-P.; Wei, L.-L. *Tetrahedron*, **1998**, 54, 7615.



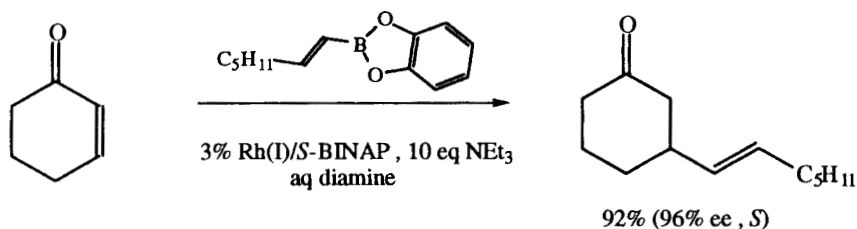
Xu, E.; Tillyer, R.D.; Tschaen, D.M.; Grabowski, E.J.J.; Reider, P.J. *Tetrahedron Asymmetry*, **1998**, 9, 1651.



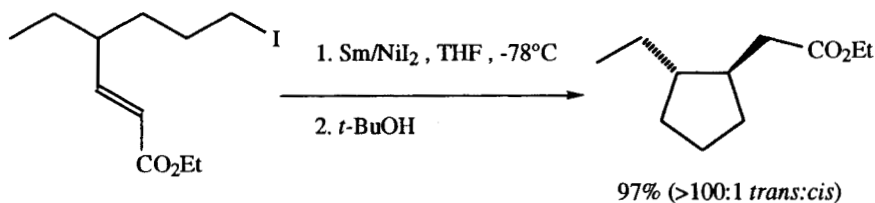
Aurell, M.J.; Mestres, R.; Muñoz, E. *Tetrahedron Lett.*, **1998**, 39, 6351.



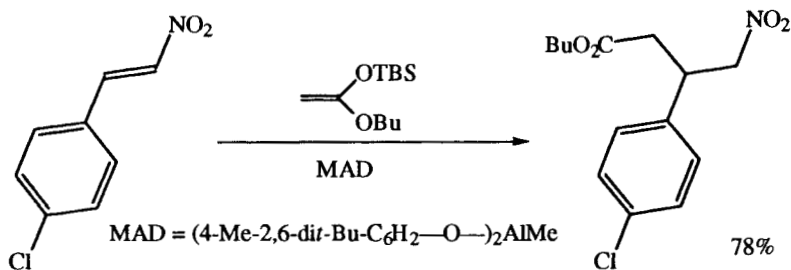
Christoffers, J. *Tetrahedron Lett.*, **1998**, 39, 7083.



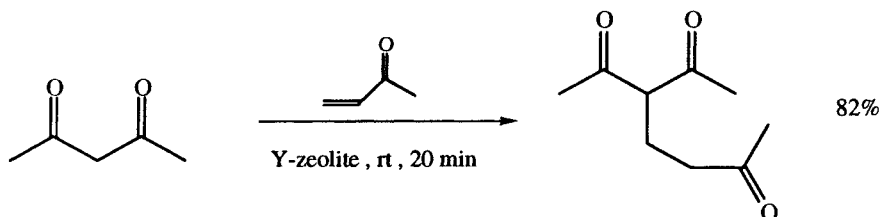
Takaya, Y.; Ogasawara, M.; Hayashi, T. *Tetrahedron Lett*, **1998**, 39, 8479.



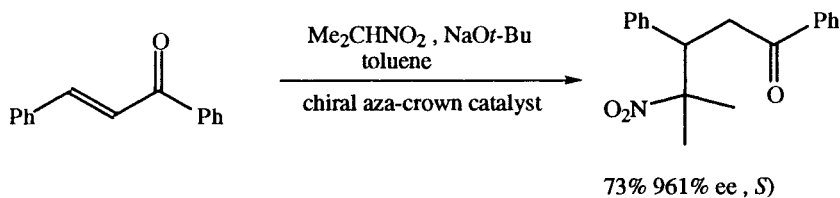
Molander, G.A.; Harris, C.R. *J. Org. Chem.*, 1997, 62, 7418.



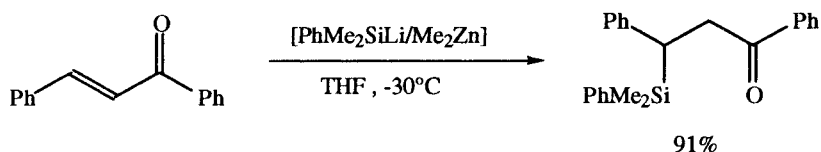
Tucker, J.A.; Clayton, T.C.; Morda, D.M. *J. Org. Chem.*, **1997**, *62*, 4370.



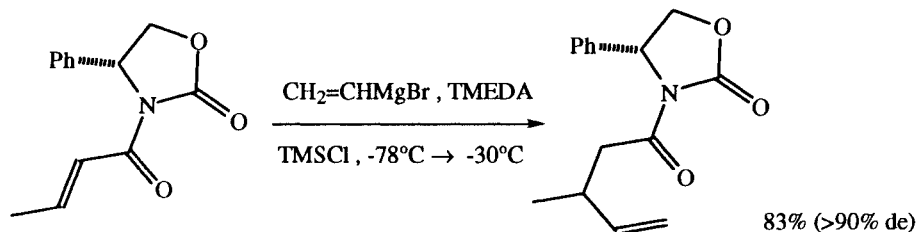
Sreekumar, R.; Rugmini, P.; Padmakumar, R. *Tetrahedron Lett.*, **1997**, 38, 6557.



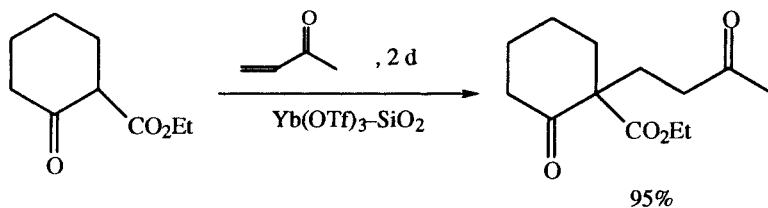
Bakó, P.; Kiss, T.; Töke, L. *Tetrahedron Lett.*, **1997**, 38, 7259.



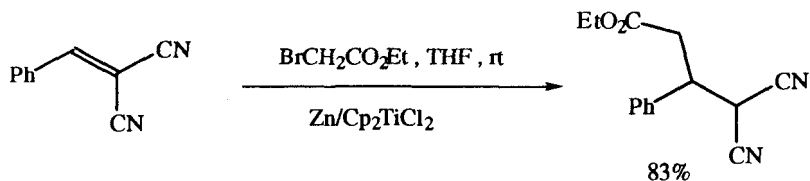
MacLean, B.L.; Henningar, K.A.; Kells, K.W.; Singer, R.D. *Tetrahedron Lett.*, **1997**, 38, 7313



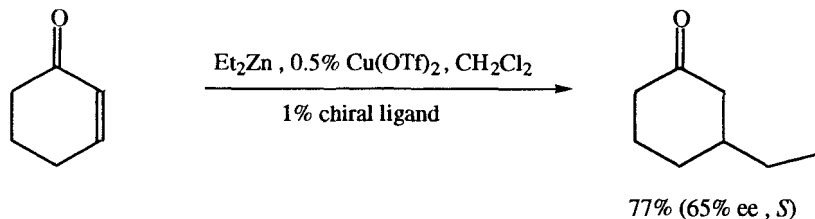
Han, Y.; Hruby, V.J. *Tetrahedron Lett.*, **1997**, 38, 7317.



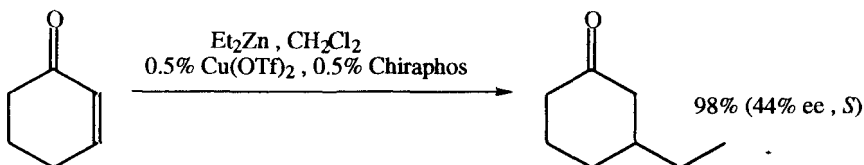
Kotsuki, H.; Arimura, K. *Tetrahedron Lett.*, **1997**, 38, 7583.



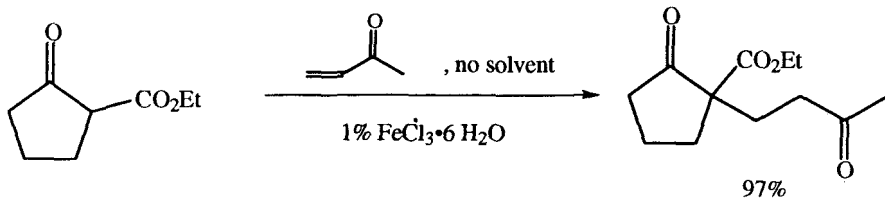
Ding, Y.; Zhao, Z.; Zhou, C. *Tetrahedron*, **1997**, 53, 2899.



Alexakis, A.; Vastra, J.; Burton, J.; Mangeney, P. *Tetrahedron Asymmetry*, **1997**, 8, 3193.

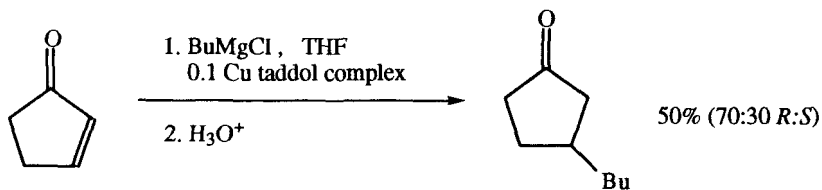


Alexakis, A.; Burton, J.; Vastra, J.; Mangeney, P. *Tetrahedron Asymmetry*, **1997**, 8, 3987.

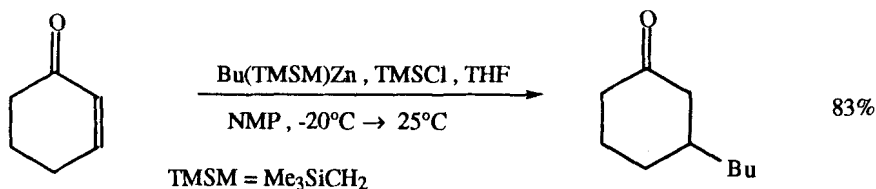


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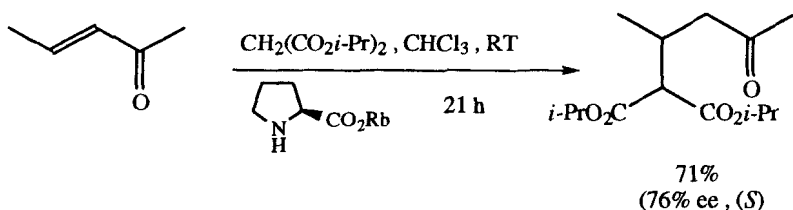
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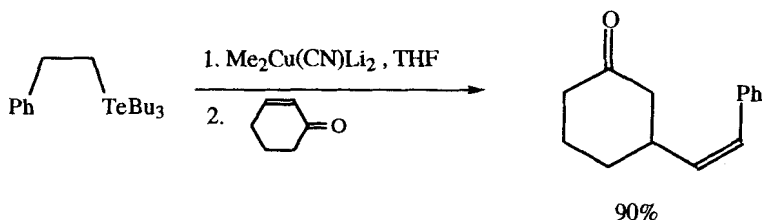
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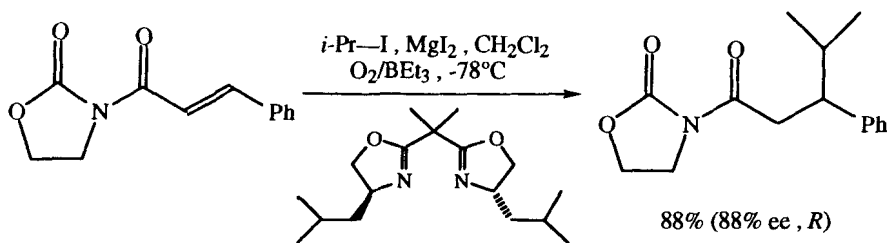
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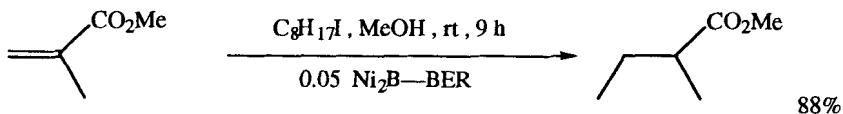
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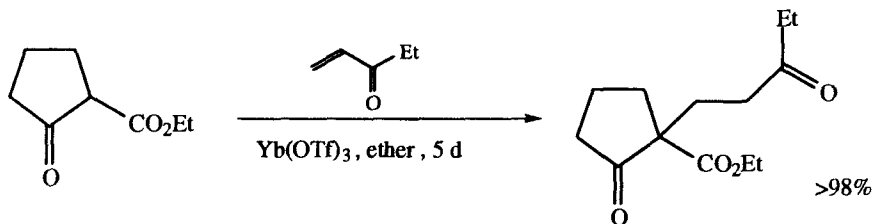


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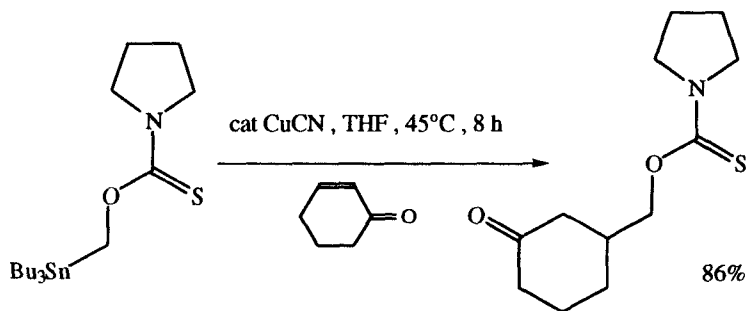


BER = borohydride exchange resin

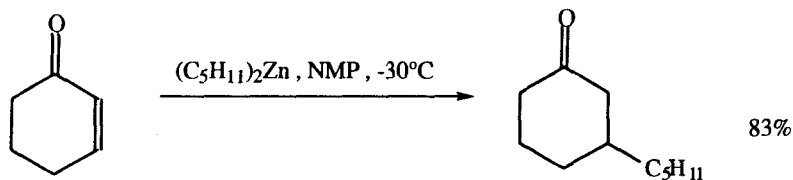
Sim, T.B.; Choi, J.; Yoon, N.M. *Tetrahedron Lett.*, **1996**, *37*, 3137.



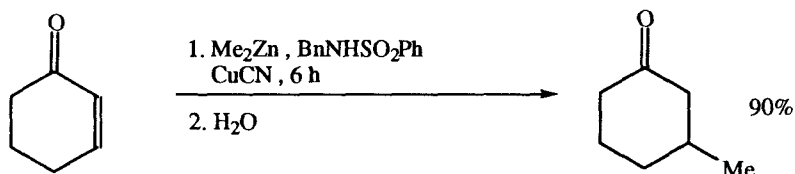
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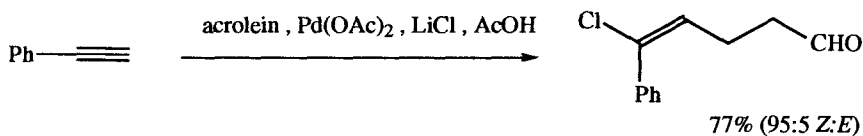
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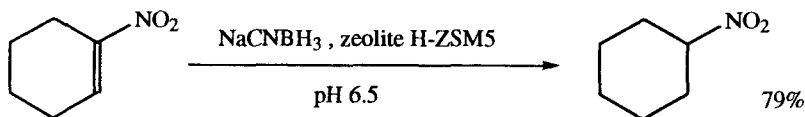
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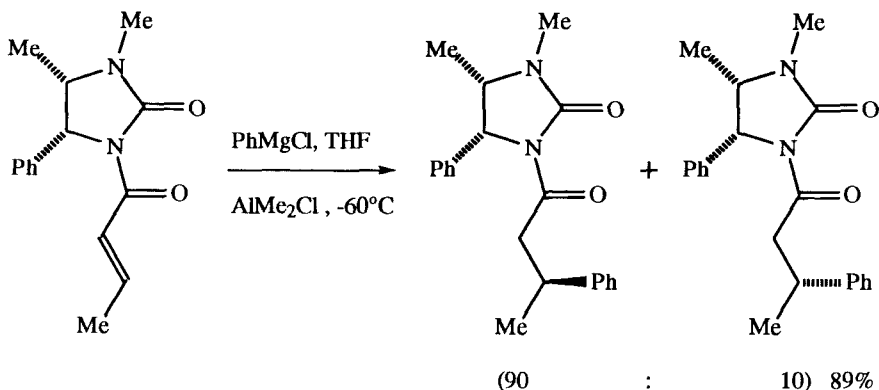
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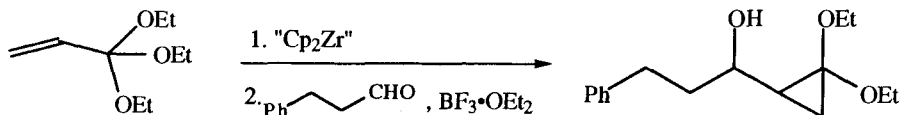


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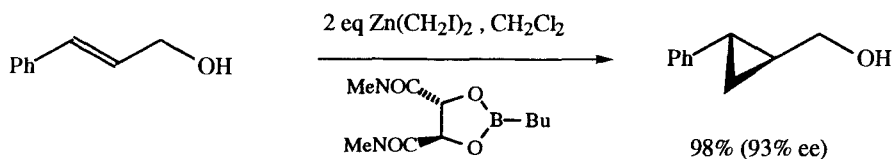


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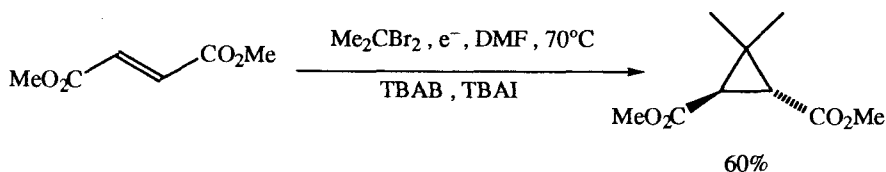
## SECTION 74F: Cyclopropanations, including Halocyclopropanations



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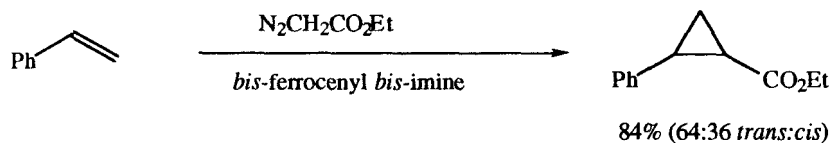


Charette, A.B.; Juteau, H.; Lebel, H.; Molinaro, C. *J. Am. Chem. Soc.*, **1998**, 120, 11942.

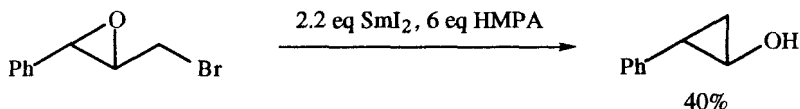


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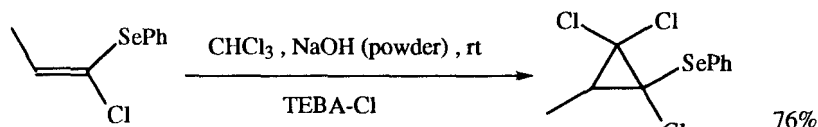




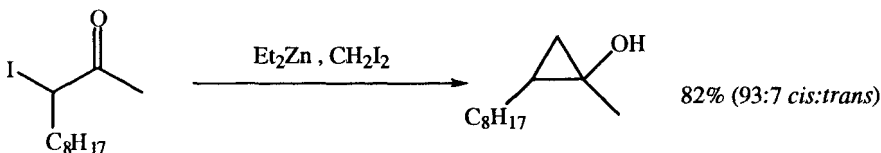
Cho, D.-J.; Jeon, S.-J.; Kim, H.-S.; Kim, T.-L. *SynLett*, **1998**, 617.



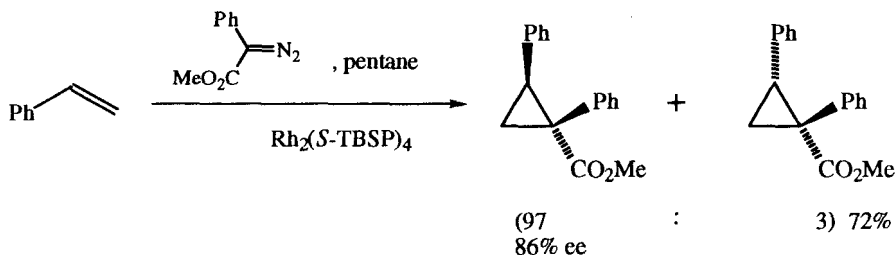
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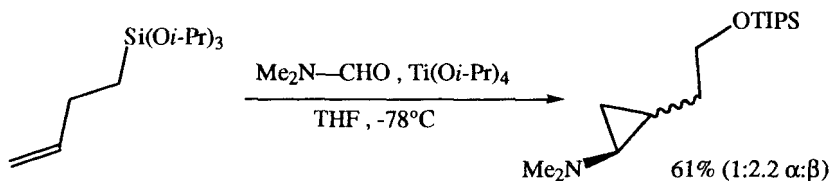
Stefani, H.A.; Petragani, N.; Comasseto, J.V.; Braga, A.; Menezes, P.H. *Synth. Commun.*, **1998**, 28, 1667.



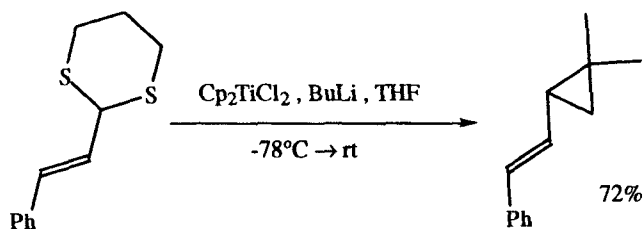
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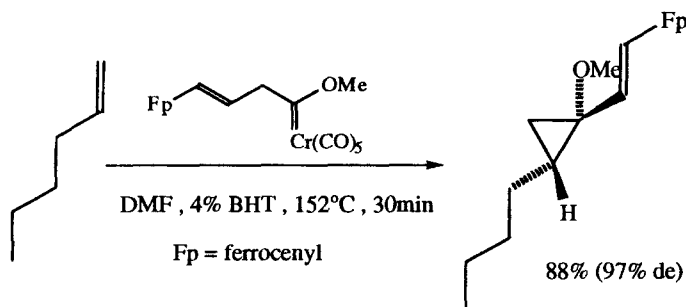
Davies, H.M.L.; Rusiniak, L. *Tetrahedron Lett.*, **1998**, 39, 8811.



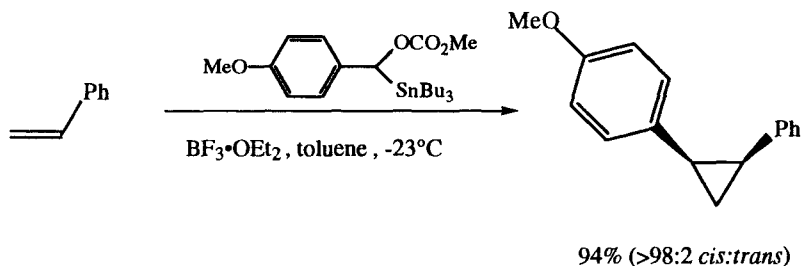
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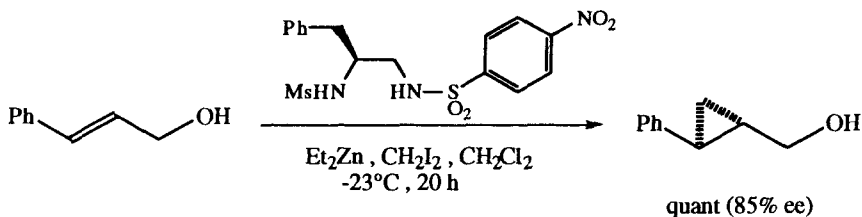
Horikawa, Y.; Nomura, T.; Watanabe, M.; Fujiwara, T.; Takeda, T.  
*J. Org. Chem.*, **1997**, 62, 3678.



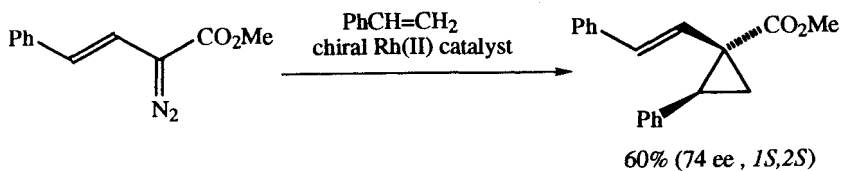
Barluenga, J.; Fernández-Acebes, A.; Trananco, A.A.; Flórez, J.  
*J. Am. Chem. Soc.*, **1997**, 119, 7591.



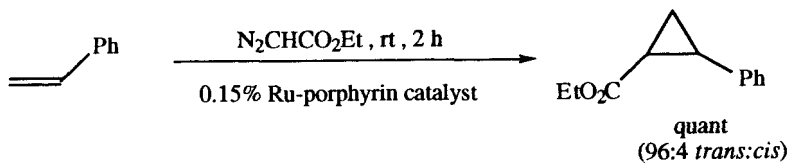
Sugawara, M.; Yosida, J. *J. Am. Chem. Soc.*, **1997**, 119, 11986.



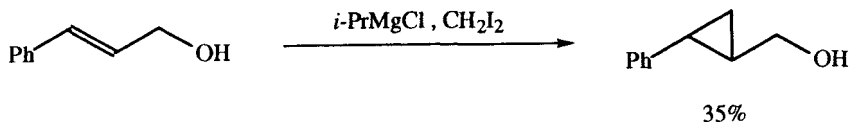
Imai, N.; Sakamoto, K.; Maeda, M.; Kouge, K.; Yoshizane, K.; Nokami, I.  
*Tetrahedron Lett.*, **1997**, 38, 1423.



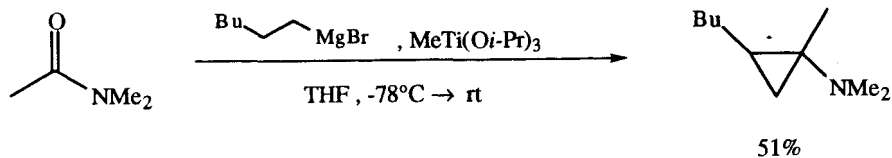
Davies, H.M.L.; Kong, N. *Tetrahedron Lett.*, **1997**, 38, 4203.



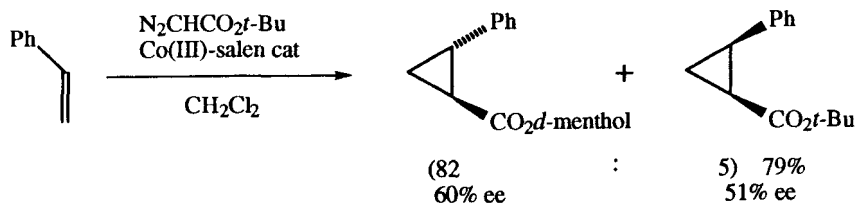
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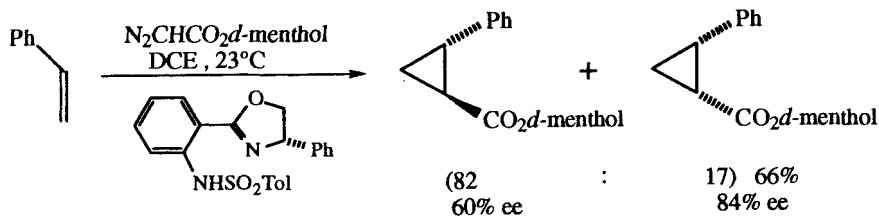
Bolm, C.; Pupowicz, D. *Tetrahedron Lett.*, **1997**, 38, 7349.



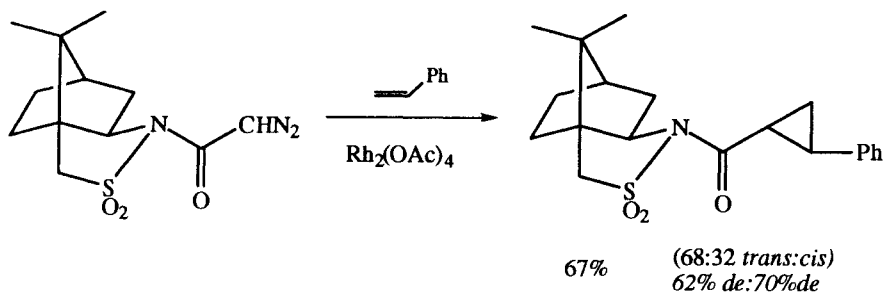
Chaplinski, V.; Winsel, H.; Kordes, M.; de Meijere, A. *SynLett*, **1997**, 111.



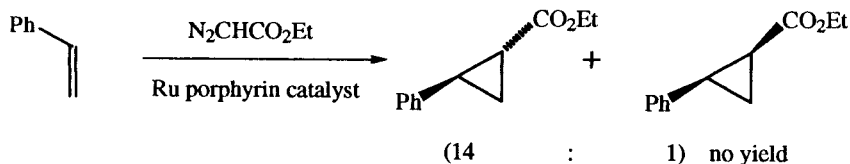
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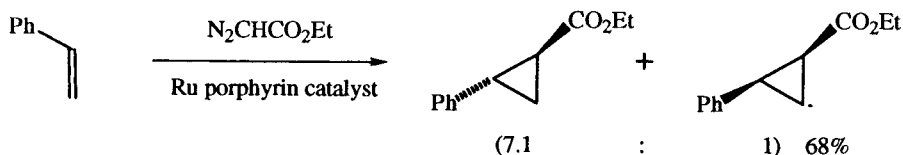
Ichiiyanagi, T.; Shimizu, M.; Fujisawa, T. *Tetrahedron*, **1997**, 53, 9599.



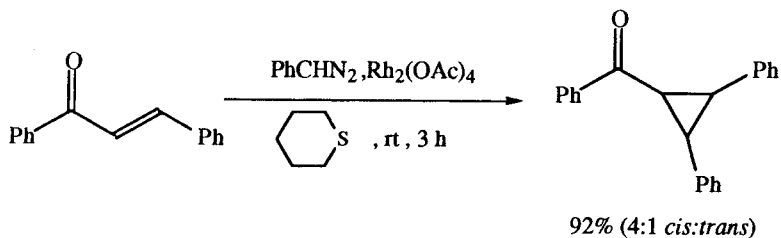
Haddad, N.; Galili, N. *Tetrahedron Asymmetry*, **1997**, 8, 3367.



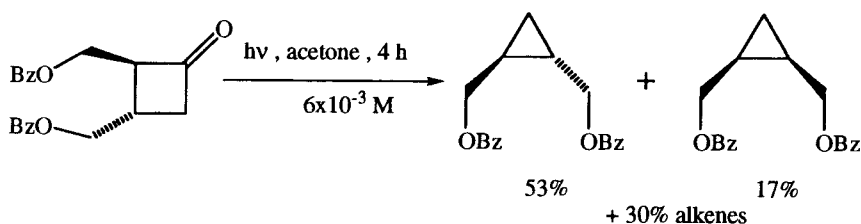
Galardon, E.; LeMaux, P.; Simonneaux, G. *Chem. Commun.*, **1997**, 927.



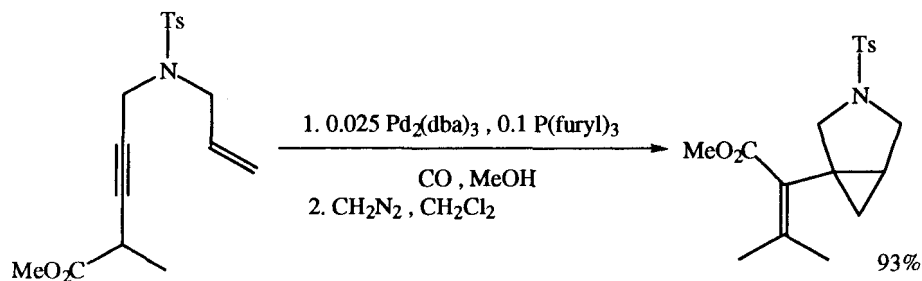
Lo, W.C.; Che, C.M.; Cheng, K.-E.; Mak, T.C.W. *Chem. Commun.*, **1997**, 1205.



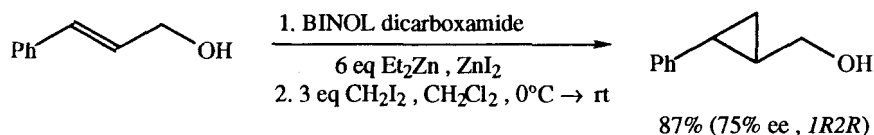
Aggarwal, V.K.; Smith, H.W.; Jones, R.V.H.; Fieldhouse, R. *Chem. Commun.*, **1997**, 1785



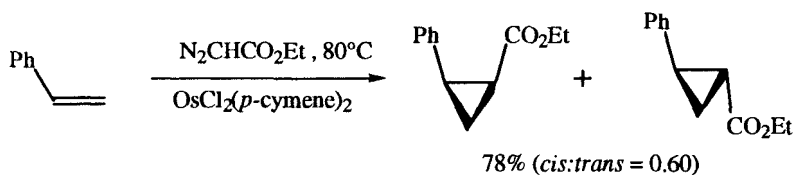
Ramnauth, J.; Lee-Ruff, E. *Can. J. Chem.*, **1997**, 75, 518.



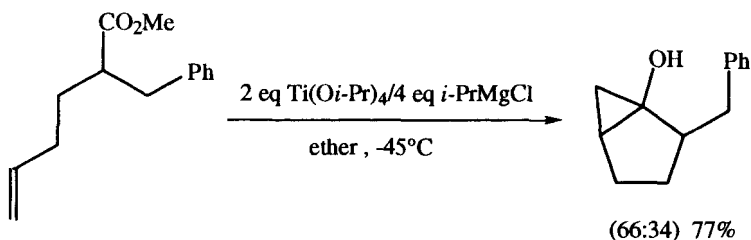
Oppolzer, W.; Pimm, A.; Stammen, B.; Hume, W.E. *Helv. Chim. Acta*, **1997**, 80, 623.



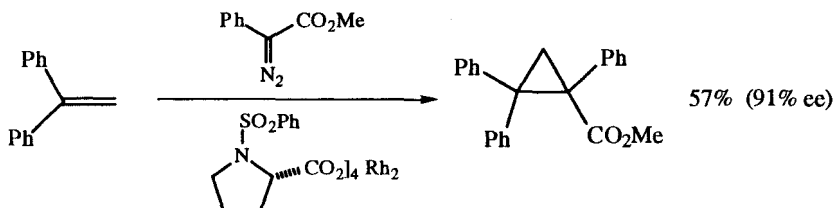
Kitajima, H.; Ito, K.; Aoki, Y.; Katsuki, T. *Bull. Chem. Soc. Jpn.*, **1997**, 70, 207.



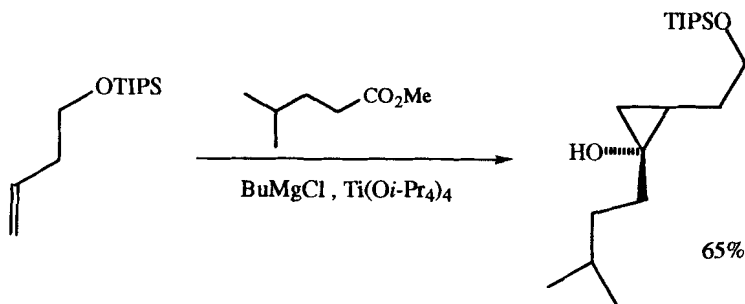
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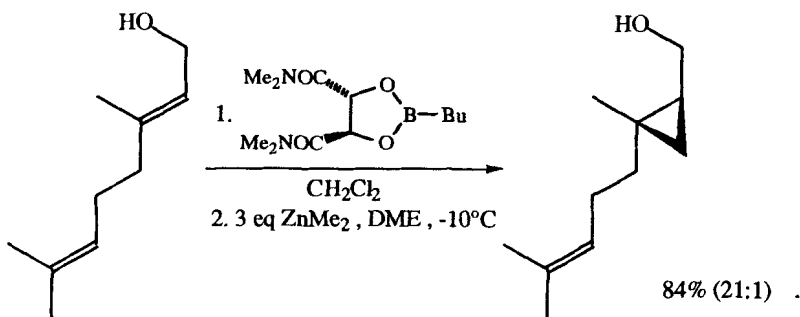
Kasatkin, A.; Kobayashi, K.; Okamoto, S.; Sato, F. *Tetrahedron Lett.*, **1996**, 37, 1849.



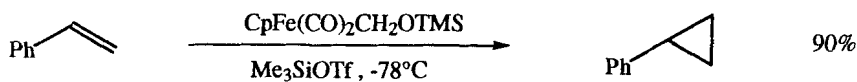
Doyle, M.P.; Zhou, Q.-L.; Charnsangavej, C.; Longoria, M.A.; McKervey, M.A.; Garcia, C.F. *Tetrahedron Lett.*, **1996**, 37, 4129.



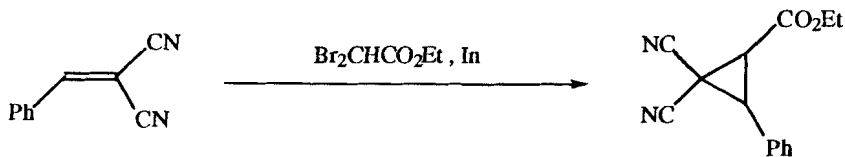
Lee, J.; Kim, H.; Cha, J.K. *J. Am. Chem. Soc.*, **1996**, 118, 4198.



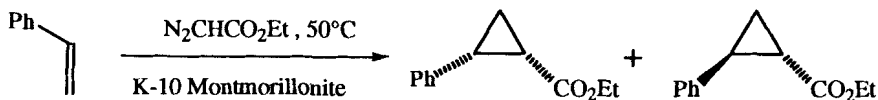
Charette, A.B.; Juteau, H.; Lebel, H.; Deschênes, D. *Tetrahedron Lett.*, **1996**, 37, 7925.



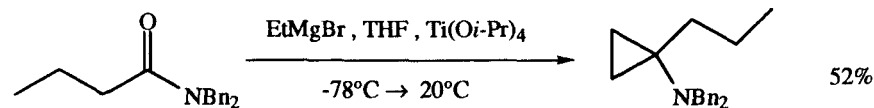
Du, H.; Yang, F.; Hossain, M.A. *Synth. Commun.*, **1996**, 26, 1371.



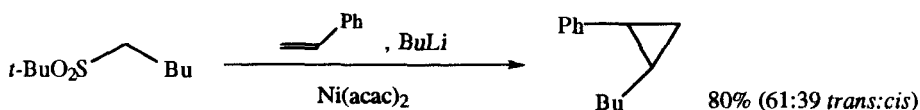
Araki, S.; Hirashita, T.; Shimizu, K.; Ikeda, T.; Butsugan, Y. *Tetrahedron*, **1996**, 52, 2803.



61% conversion, *trans:cis* = 1:1  
 Fraile, J.M.; García, J.I.; Mayoral, J.A. *Chem. Commun.*, **1996**, 1319.



Chaplinski, V.; de Meijere, A. *Angew. Chem. Int. Ed.*, **1996**, 35, 413.

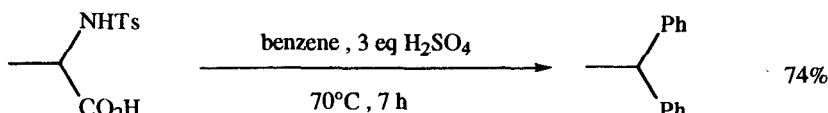


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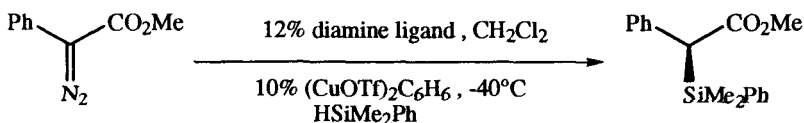
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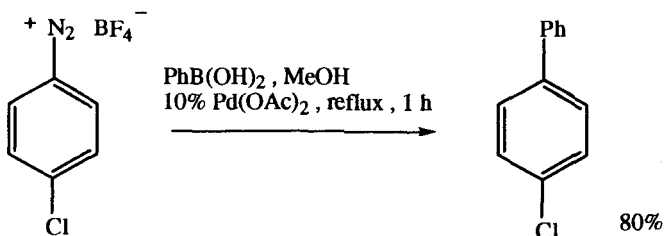
### SECTION 75: ALKYLs, METHYLENES AND ARYLs FROM MISCELLANEOUS COMPOUNDS



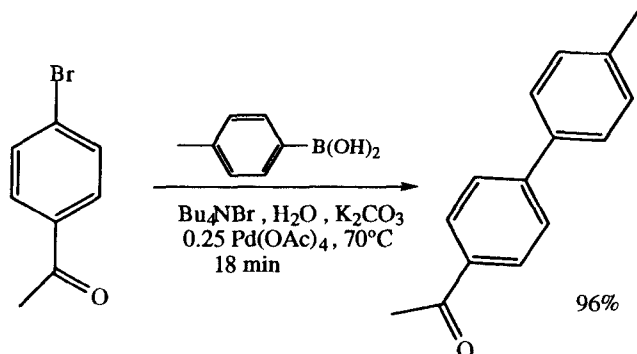
Seong, M.R.; Lee, H.J.; Kim, J.N. *Tetrahedron Lett.*, **1998**, 39, 6219.



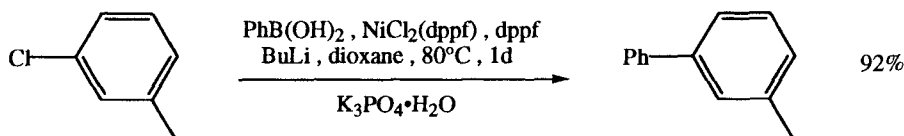
Dakin, L.A.; Schaus, S.E.; Jacobsen, E.N.; Panek, J.S. *Tetrahedron Lett.*, **1998**, 39, 8947.



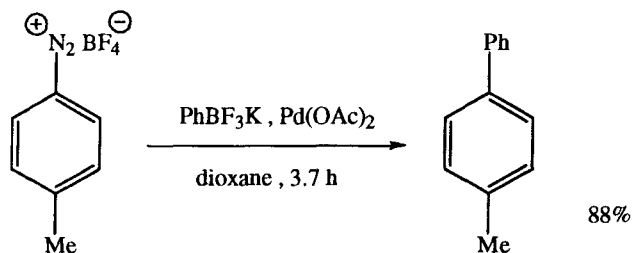
Sengupta, S.; Bhattacharyya, S. *J. Org. Chem.*, **1997**, 62, 3405.



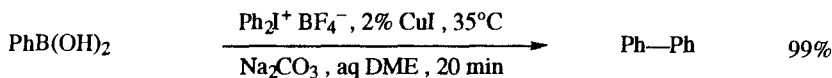
Badone, D.; Baroni, M.; Cardamone, R.; Ielmini, A.; Guzzi, U. *J. Org. Chem.* **1997**, 62, 7170



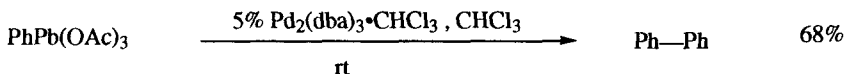
Saito, S.; Oh-tani, S.; Miyaura, N. *J. Org. Chem.*, **1997**, 62, 8024.



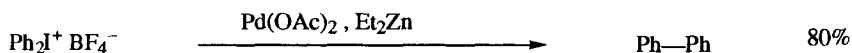
Darses, S.; Genêt, J.-P.; Brayer, J.-L.; Demoute, J.-P. *Tetrahedron Lett.*, **1997**, 38, 4393.



Kang, S.-K.; Yamaguchi, T.; Kim, T.-H.; Ho, P.-S. *J. Org. Chem.*, **1996**, 61, 9082.

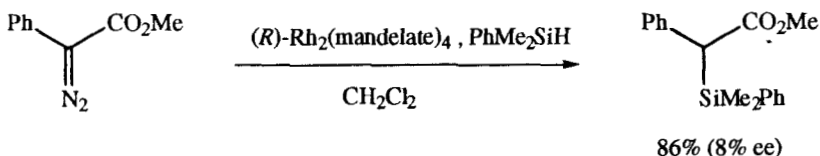
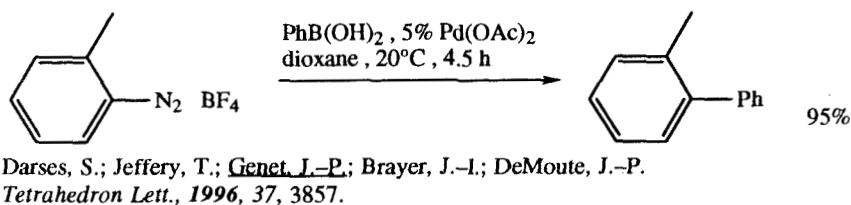
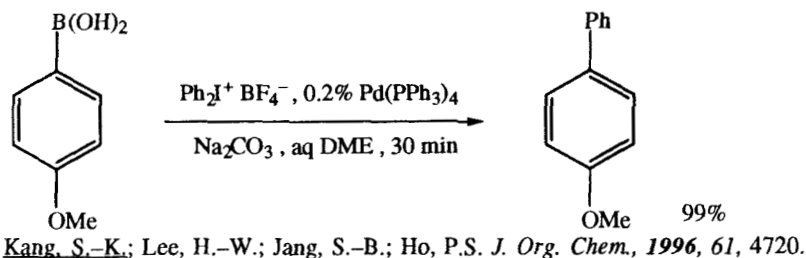
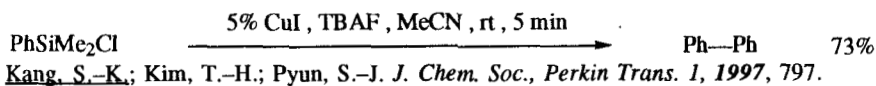


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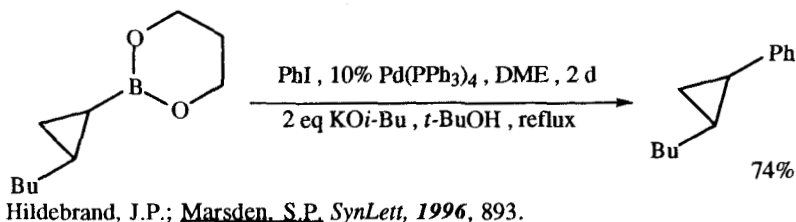


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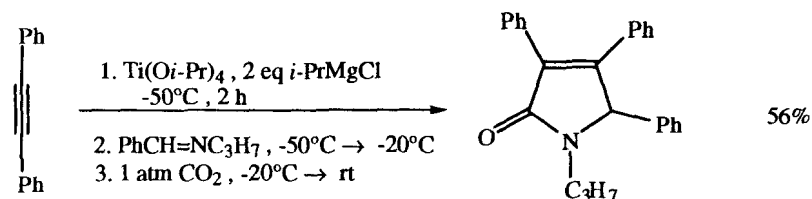
Buck, R.T.; Doyle, M.P.; Drysdale, M.J.; Ferris, L.; Forbes, D.C.; Haigh, D.; Moody, C.J.; Pearson, N.D.; Zhou, Q.-L. *Tetrahedron Lett.*, **1996**, 37, 7631.



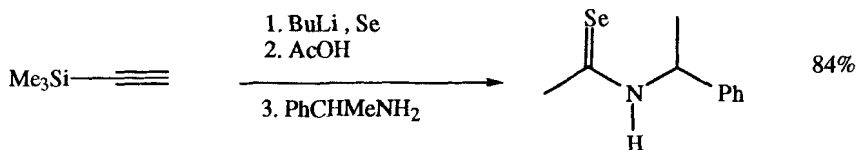
## CHAPTER 6

### PREPARATION OF AMIDES

#### SECTION 76: AMIDES FROM ALKYNES

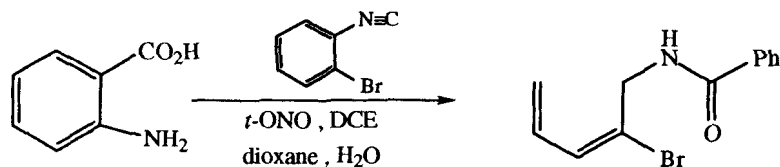


Gao, Y.; Shirai, M.; Sato, F. *Tetrahedron Lett.*, **1997**, 38, 6849.

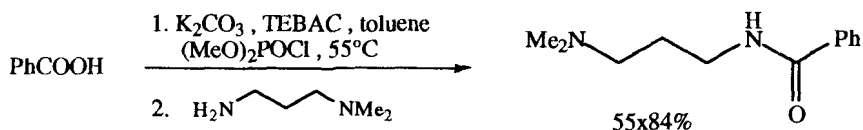


Murai, T.; Ezaka, T.; Niwa, N.; Kanda, T.; Kato, S. *SynLett*, **1996**, 865.

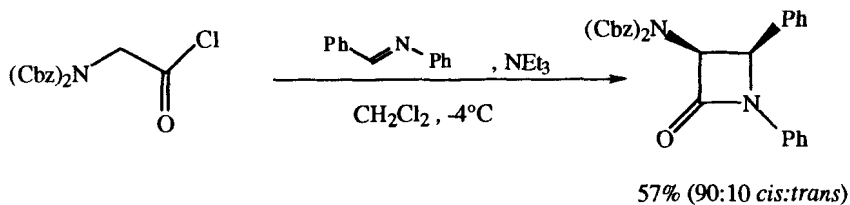
#### SECTION 77: AMIDES FROM ACID DERIVATIVES



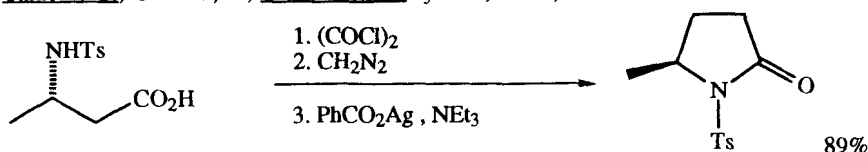
Rigby, J.H.; Laurent, S. *J. Org. Chem.*, **1998**, 63, 6742.



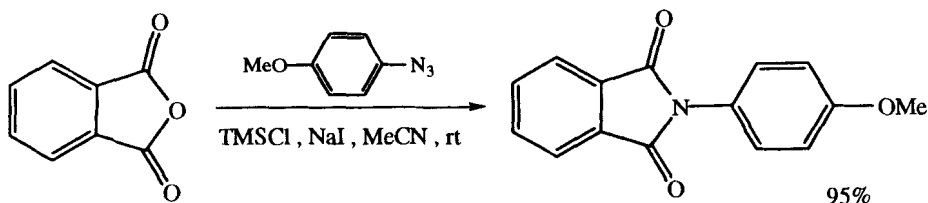
Jászay, Z.M.; Petneházy, I.; Tőke, L. *Synth. Commun.*, **1998**, 28, 2761.



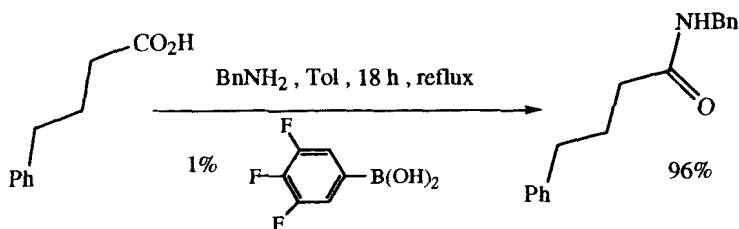
Cainelli, G.; Gallenti, P.; Giacomini, D. *SynLett*, **1998**, 611.



Wang, J.; Hou, Y. *J. Chem. Soc., Perkin Trans. 1*, **1998**, 1919.

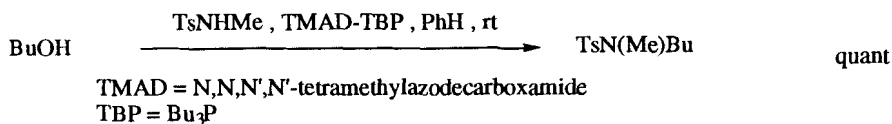


Kamal, A.; Laxman, E.; Laxman, N.; Rao, N.V. *Tetrahedron Lett*, **1998**, 39, 8733.

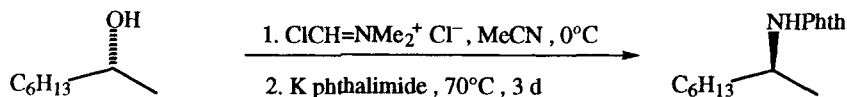


Ishihara, K.; Ohara, S.; Yamamoto, H. *J. Org. Chem.*, **1996**, 61, 4196.

## SECTION 78: AMIDES FROM ALCOHOLS AND THIOLS

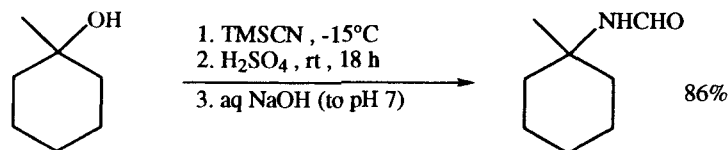


Tsunoda, T.; Kawamura, Y.; Uemoto, K.; Itô, S. *Heterocycles*, **1998**, 47, 177.



95%

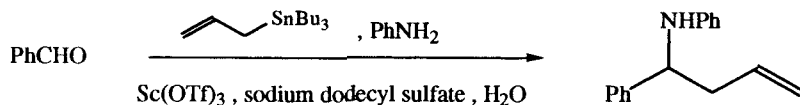
Barrett, A.G.M.; Braddock, D.C.; James, R.A.; Procopiou, P.A. *Chem. Commun.*, **1997**, 433.



86%

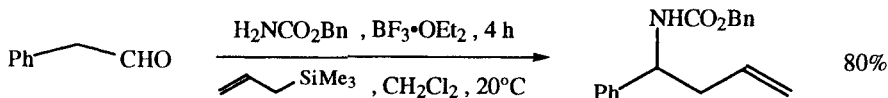
Chen, H.G.; Goel, O.P.; Kesten, S.; Knobelsdorf, J. *Tetrahedron Lett.*, **1996**, 37, 8129.

## SECTION 79: AMIDES FROM ALDEHYDES



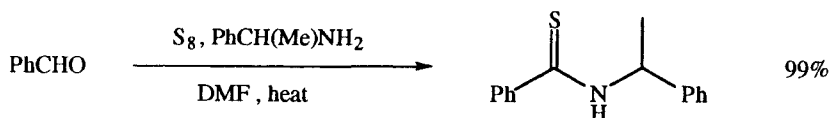
80%

Kobayashi, S.; Busujima, T.; Nagayama, S. *Chem. Commun.*, **1998**, 19.



80%

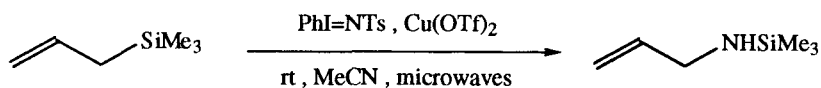
Veenstra, S.J.; Schmid, P. *Tetrahedron Lett.*, **1997**, 38, 997.



99%

Kanyonyo, M.R.; Gozzo, A.; Lambert, D.M.; Lesieur, D.; Poupaert, J.H. *Bull. Soc. Chim. Belg.*, **1997**, 106, 39.

## SECTION 80: AMIDES FROM ALKYL, METHYLENES AND ARYL

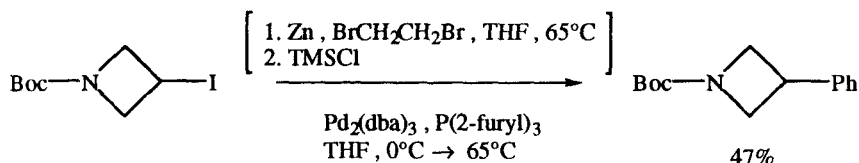


78%

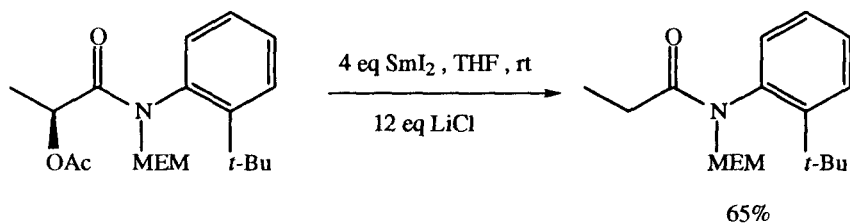
Kim, D.Y.; Choi, J.S.; Rhie, D.Y.; Chang, S.K.; Kim, I.K. *Synth. Commun.*, **1997**, 27, 2753

## SECTION 81: AMIDES FROM AMIDES

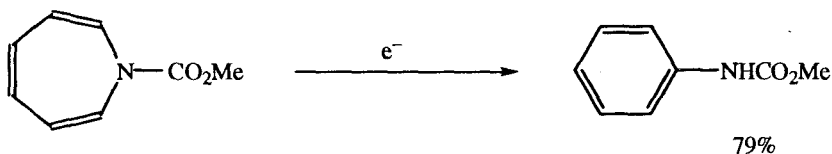
Conjugate reductions of unsaturated amides are listed in Section 74D (Alkyls from Alkenes)



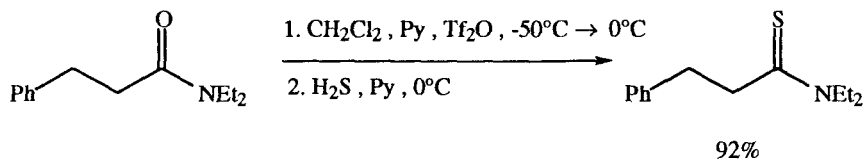
Billotte, S., *SynLett*, **1998**, 379.



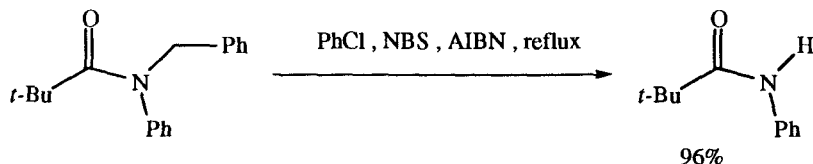
Hughes, A.D.; Simpkins, N.S., *SynLett*, **1998**, 967.



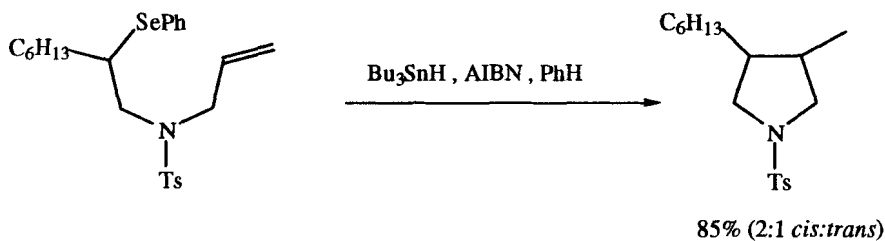
Kondo, S.; Suzuki, H.; Hattori, T.; Ido, T.; Saito, K., *Heterocycles*, **1998**, **48**, 1151.



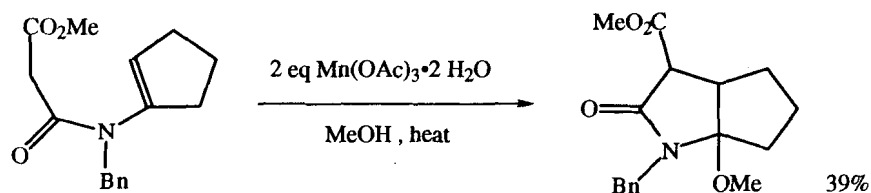
Charette, A.B.; Chua, P. *Tetrahedron Lett*, **1998**, **39**, 245.



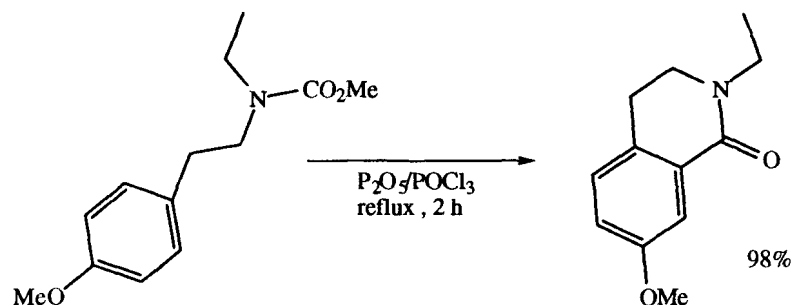
Baker, S.R.; Parsons, A.F.; Wilson, M. *Tetrahedron Lett.*, **1998**, **39**, 331.



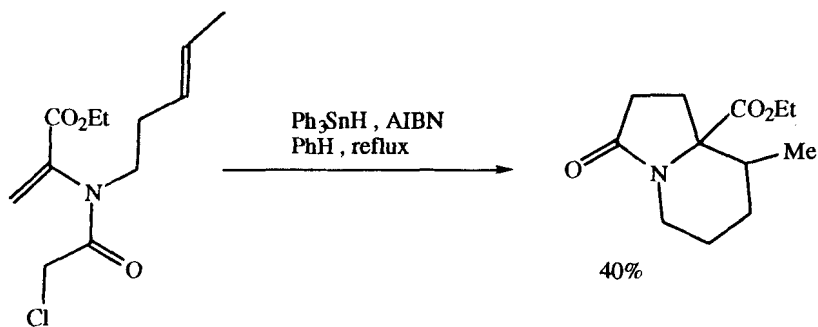
Gupta, V.; Besev, M.; Engman, L. *Tetrahedron Lett.*, **1998**, 39, 2429.



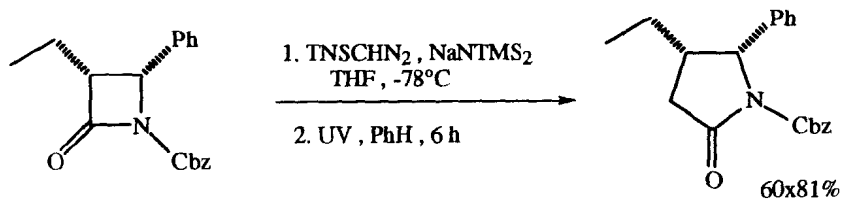
Davies, D.T.; Kapur, N.; Parsons, A.E. *Tetrahedron Lett.*, **1998**, 39, 4397.



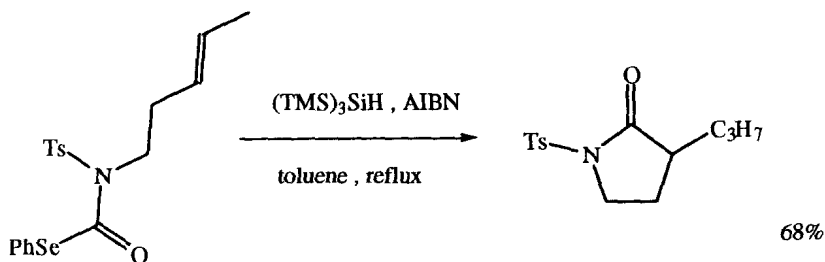
Wang, X.-j.; Tan, J.; Grozinger, K. *Tetrahedron Lett.*, **1998**, 39, 6609.



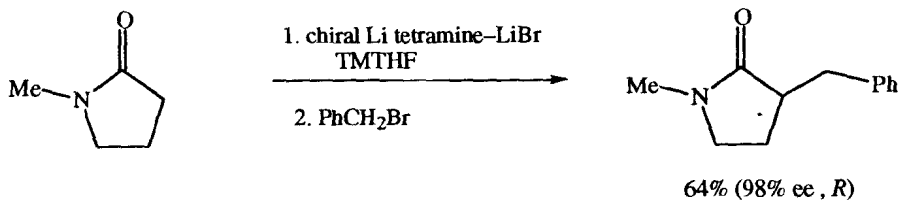
Baker, S.R.; Parsons, A.E.; Pons, J.-F.; Wilson, M. *Tetrahedron Lett.*, **1998**, 39, 7197.



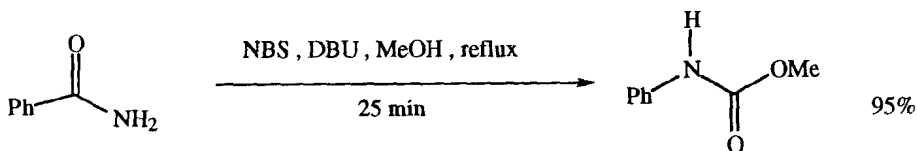
Varma, R.S.; Naicker, K.P. *Tetrahedron Lett*, **1998**, 39, 7463.



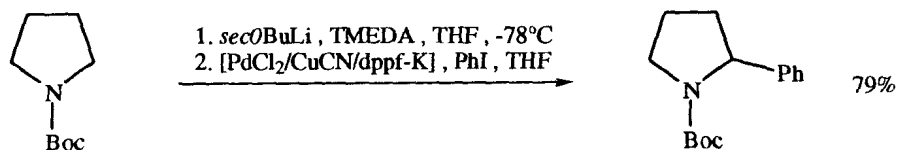
Rigby, J.H.; Danca, D.M.; Horner, J.H. *Tetrahedron Lett.*, **1998**, 39, 8413.



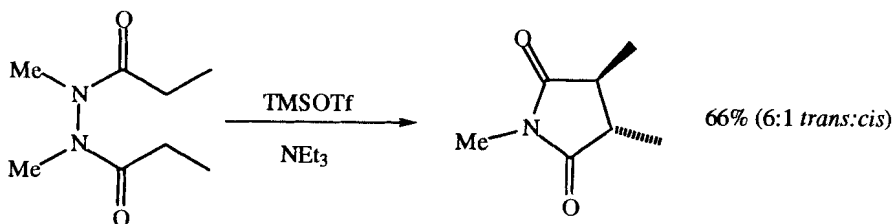
Matsuo, J.-i.; Kobayashi, S.; Koga, K. *Tetrahedron Lett*, **1998**, 39, 9723.



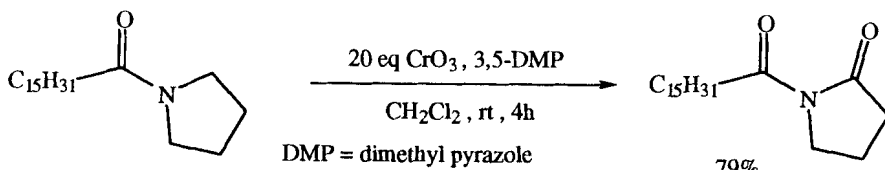
Huang, X.; Seid, M.; Keillor, J.W. *J. Org. Chem.*, **1997**, 62, 7495.



Dieter, R.K.; Li, S.J. *J. Org. Chem.*, **1997**, 62, 7726.

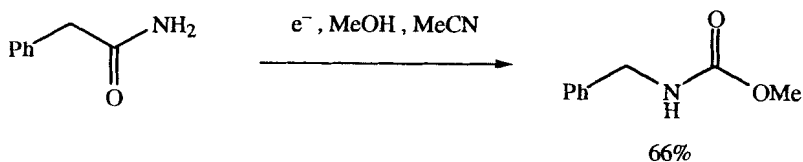


Miller, S.L.; Bayne, C.D. *J. Org. Chem.*, **1997**, *62*, 5680.

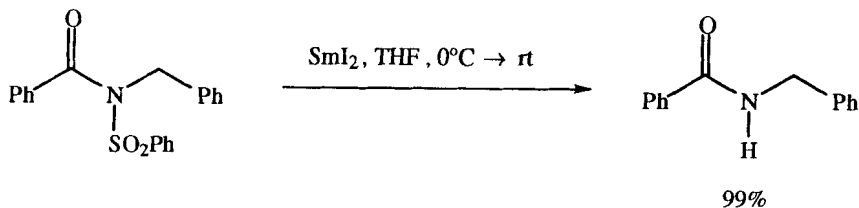


DMP = dimethyl pyrazole

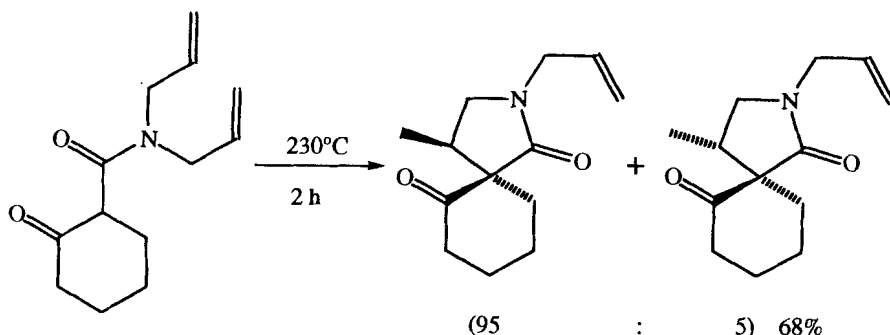
Blay, G.; Cardona, L.; García, B.; García, C.L.; Pedro, J.R. *Tetrahedron Lett.*, **1997**, *38*, 8257



Matsumura, Y.; Maki, T.; Satoh, Y. *Tetrahedron Lett.*, **1997**, *38*, 8879.

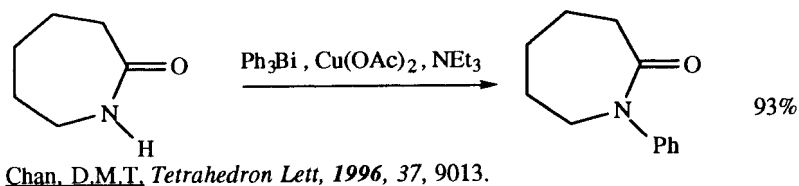
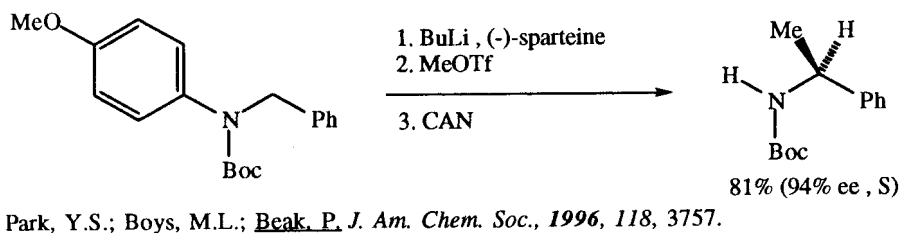
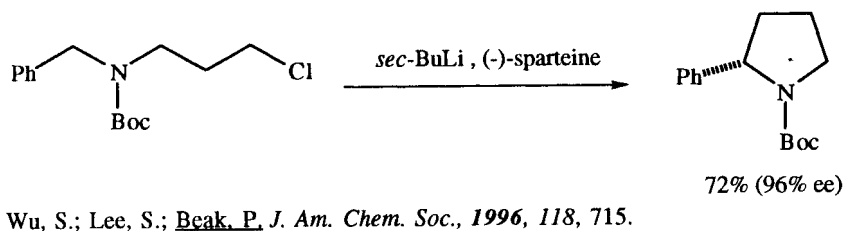
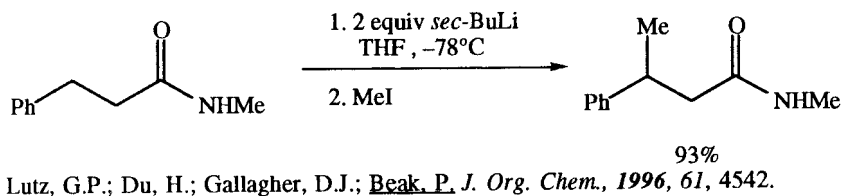
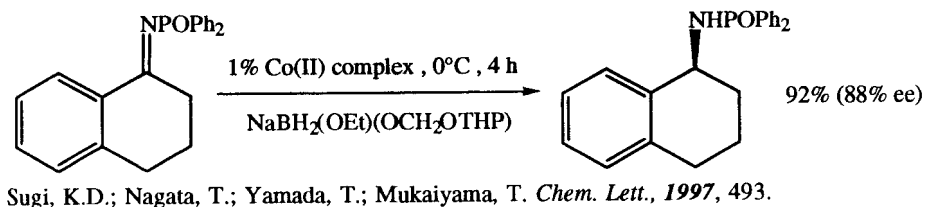
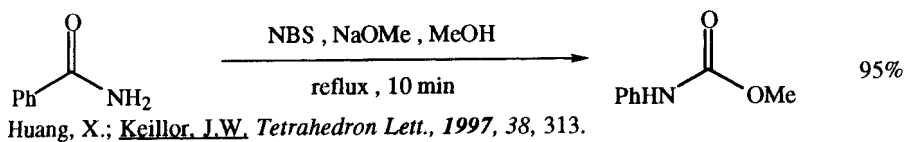


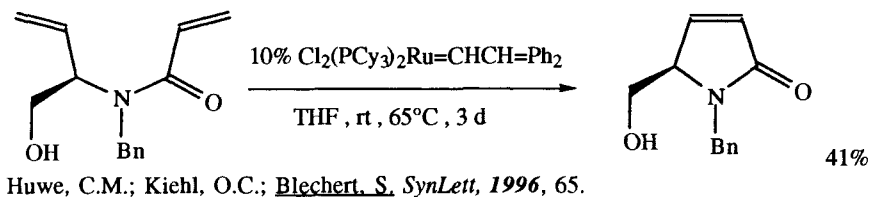
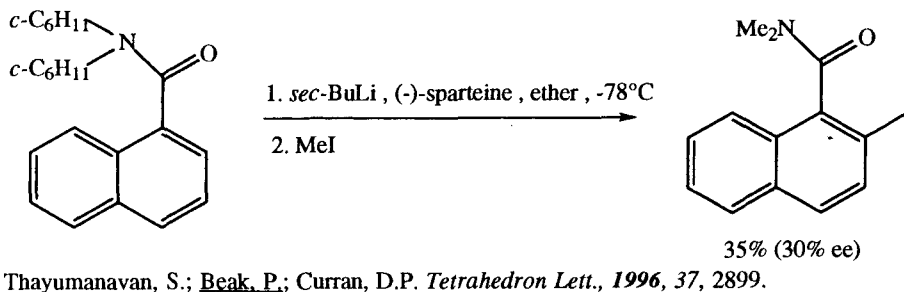
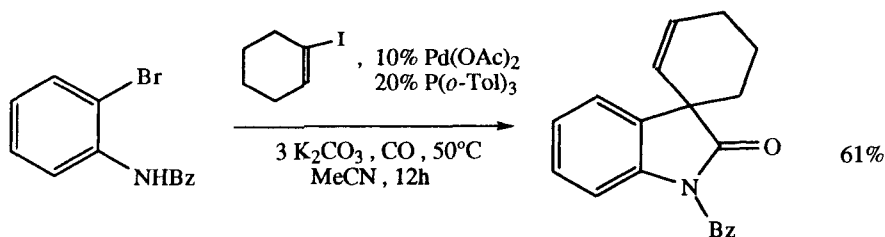
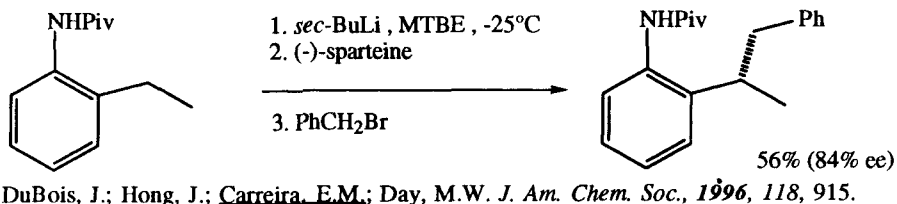
Knowles, H.; Parsons, A.E.; Pettifer, R.M. *SynLett.*, **1997**, 271.



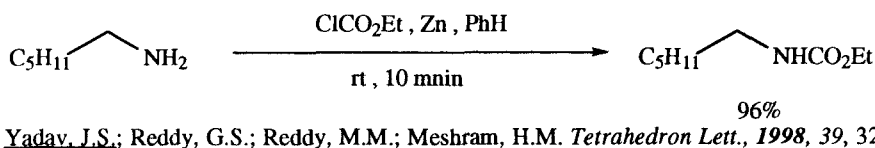
Cossy, J.; Bouzide, A. *Tetrahedron*, **1997**, *53*, 5775.

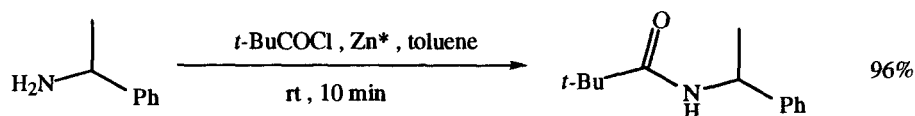




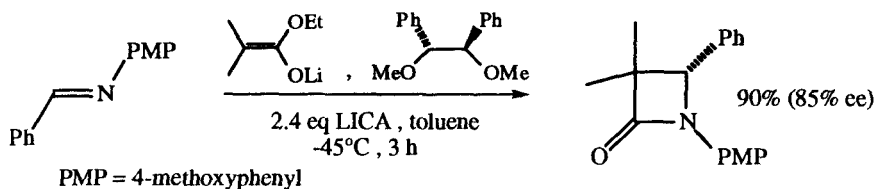


## SECTION 82: AMIDES FROM AMINES

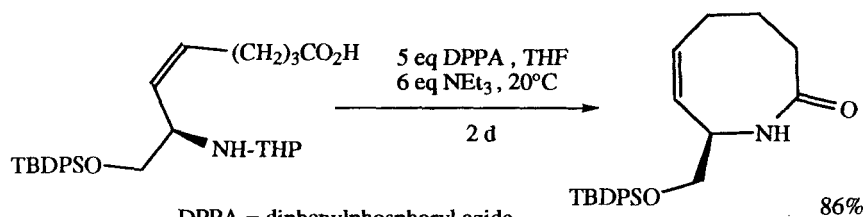




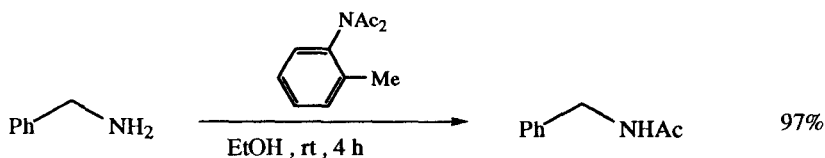
Meshram, H.M.; Reddy, G.S.; Reddy, M.M.; Yadav, J.S. *Tetrahedron Lett.*, **1998**, 39, 4103.



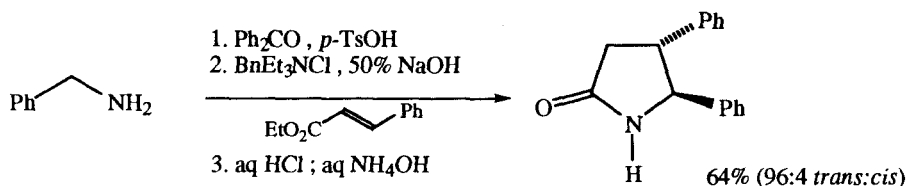
Kambara, T.; Hussein, M.A.; Fujieda, H.; Iida, A.; Tomioaka, K.  
*Tetrahedron Lett.* **1998**, 39, 9055.



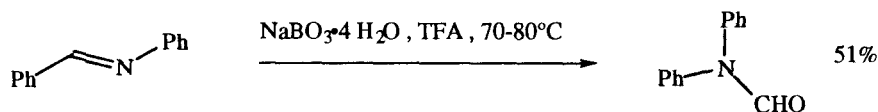
DPPA = diphenylphosphoryl azide  
Derrer, S.; Feeder, N.; Teat, S.J.; Davies, J.E.; Holmes, A.B. *Tetrahedron Lett.* **1998**, 39, 9309



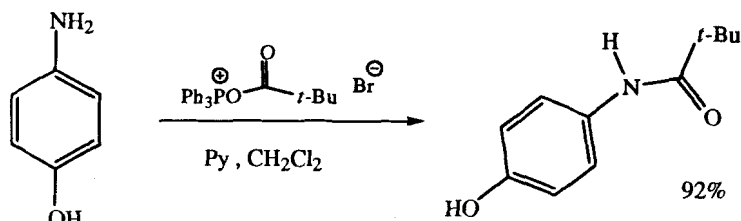
Murakami, Y.; Kondo, K.; Miki, K.; Akiyama, Y.; Watanabe, T.; Yokeyama, Y. *Tetrahedron Lett.*, **1997**, 38, 3751.



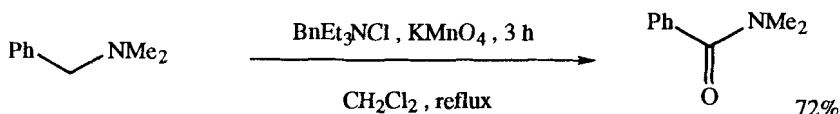
Yee, N.K. *Tetrahedron Lett.*, 1997, 38, 5091.



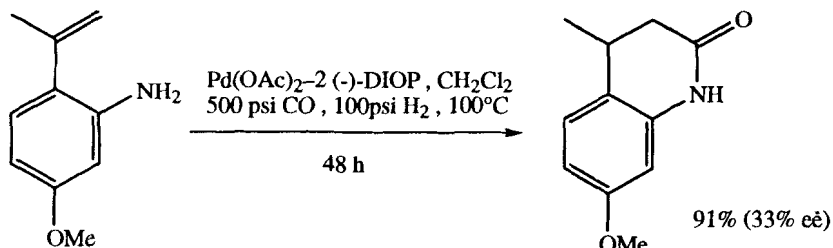
Nongkunsarn, P.; Ramsden, C.A. *Tetrahedron*, **1997**, 53, 3805.



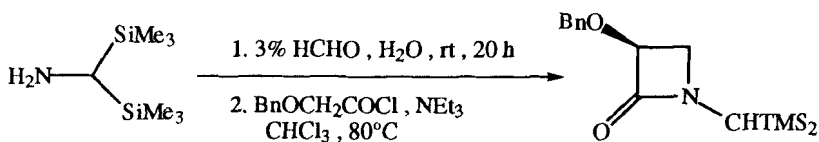
Frøyen, P. *Tetrahedron Lett.*, **1997**, 38, 5359.



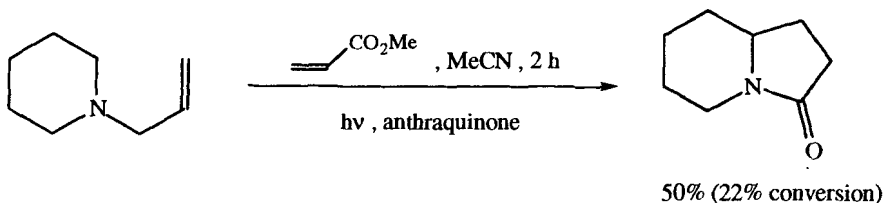
Markgraf, J.H.; Sangani, P.K.; Finkelstein, M. *Synth. Commun.*, **1997**, 27, 1285.



Okuro, K.; Kai, H.; Alper, H. *Tetrahedron Asymmetry*, **1997**, 8, 2307.



Palomo, C.; Aizpurua, J.M.; Legido, M.; Galarza, R. *Chem. Commun.*, **1997**, 233.

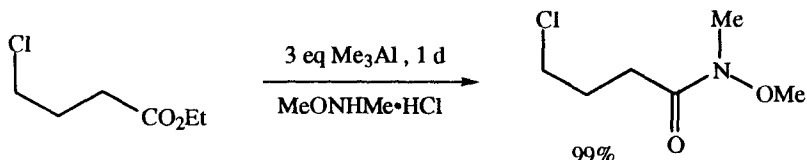


Das, S.; Kumar, J.S.D.; Shivaramayya, K.; George, M.V. *Tetrahedron*, **1996**, 52, 3425.



Casadei, M.A.; Inesi, A.; Moracci, F.M.; Rossi, L. *Chem. Commun.*, **1996**, 2575.

## SECTION 83: AMIDES FROM ESTERS

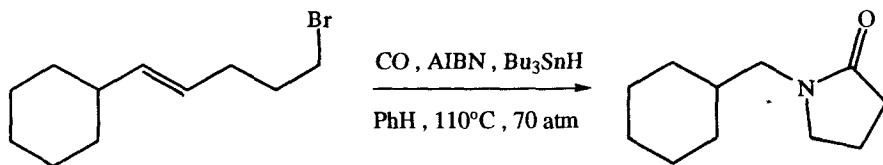


Shimizu, T.; Osako, K.; Nakata, T. *Tetrahedron Lett.*, **1997**, 38, 2685.

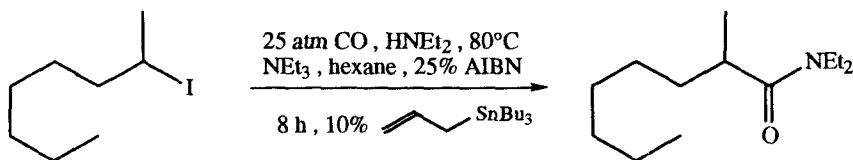
## SECTION 84: AMIDES FROM ETHERS, EPOXIDES AND THIOETHERS

NO ADDITIONAL EXAMPLES

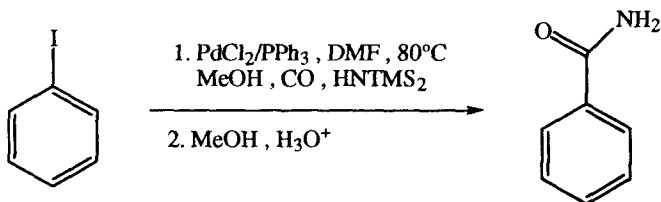
## SECTION 85: AMIDES FROM HALIDES AND SULFONATES



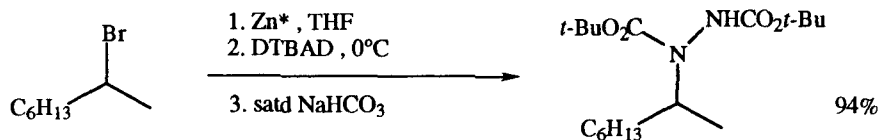
Ryu, I.; Matsu, K.; Minakata, S.; Komatsu, M. *J. Am. Chem. Soc.*, **1998**, 120, 5838.



Ryu, I.; Nagahara, K.; Kambe, N.; Sonoda, N.; Kreimerman, S.; Komatsu, M. *Chem. Commun.*, **1998**, 1953.

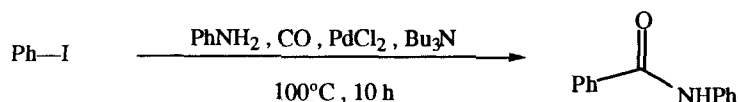


Morera, E.; Ortiz, G. *Tetrahedron Lett.*, **1998**, 39, 2835.

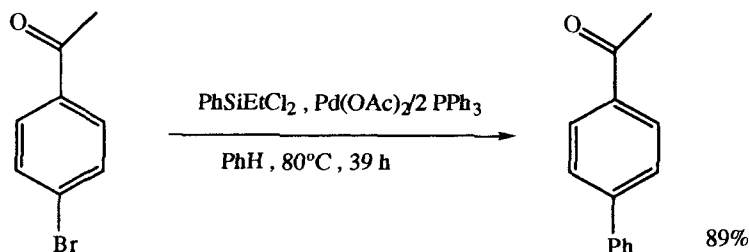


DTAB = di-*t*-butylazodicarboxylate

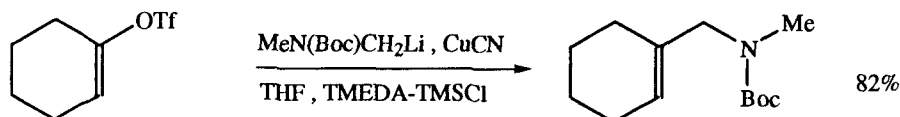
Velarde-Ortiz, R.; Guijarro, A.; Rieke, R.D. *Tetrahedron Lett.*, **1998**, 39, 9157.



Cai, M.-Z.; Song, C.-S.; Huang, X. *Synth. Commun.*, **1997**, 27, 361.

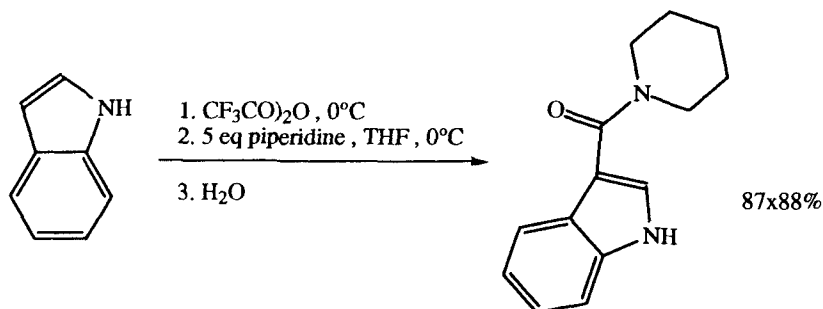


Hagiwara, E.; Gouda, K.-i.; Hatanaka, Y.; Hiyama, T. *Tetrahedron Lett.*, **1997**, 38, 439.

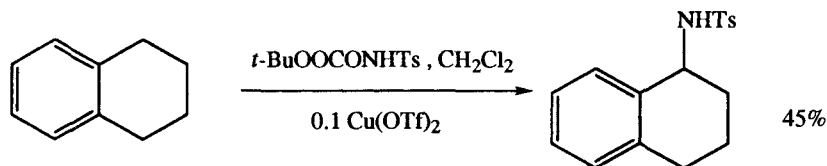


Dieter, R.K.; Dieter, J.W.; Alexander, C.W.; Bhinderwala, N.S. *J. Org. Chem.*, **1996**, 61, 2930

## SECTION 86: AMIDES FROM HYDRIDES

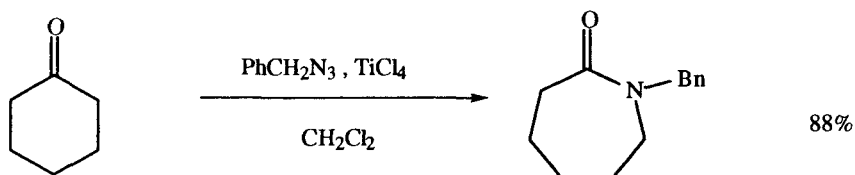


Hassinger, H.L.; Soll, R.M.; Gribble, G.W. *Tetrahedron Lett.*, **1998**, 39, 3095.

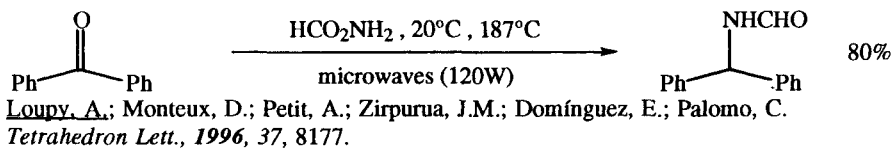


Kohmura, Y.; Kawasaki, K.; Katsuki, T. *SynLett*, **1997**, 1456.

## SECTION 87: AMIDES FROM KETONES

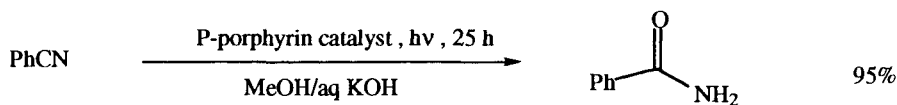


Schildknecht, K.; Agrios, K.A.; Aubé, J. *Tetrahedron Lett.*, **1998**, 39, 7687.

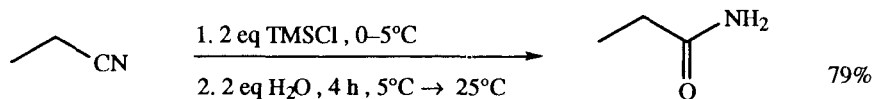


Loupy, A.; Monteux, D.; Petit, A.; Zirpurua, J.M.; Domínguez, E.; Palomo, C. *Tetrahedron Lett.*, **1996**, 37, 8177.

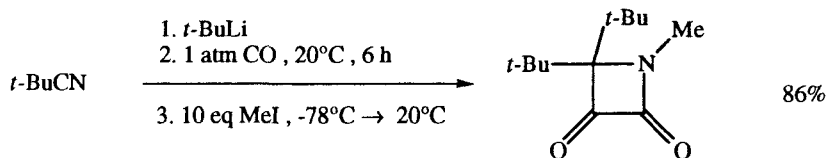
## SECTION 88: AMIDES FROM NITRILES



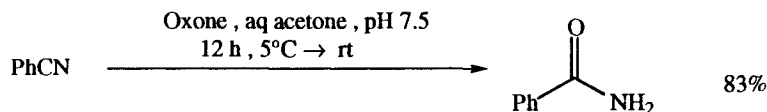
Igarashi, T.; Konishi, K.; Aida, T. *Chem. Lett.*, **1998**, 1039.



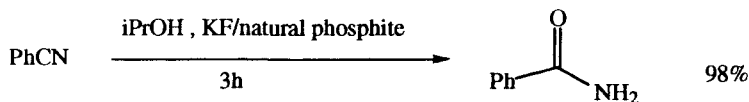
Basu, M.K.; Luo, F.-T. *Tetrahedron Lett.*, **1998**, 39, 3005.



Kai, H.; Orita, A.; Murai, S. *Synth. Commun.*, **1998**, 28, 1947.

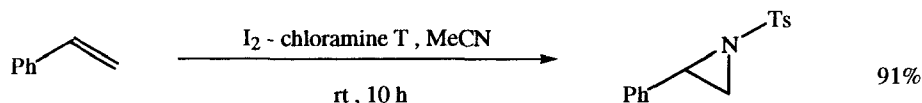


Bose, D.S.; Baquer, S.M. *Synth. Commun.*, **1997**, 27, 3119.

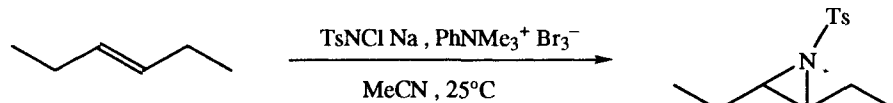


Sebti, S.; Rhihil, A.; Saber, A.; Hanafi, N. *Tetrahedron Lett.*, **1996**, 37, 6555.

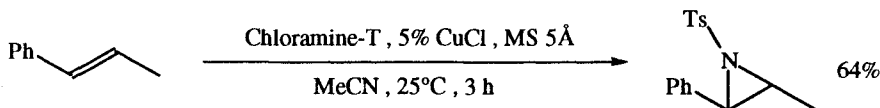
## SECTION 89: AMIDES FROM ALKENES



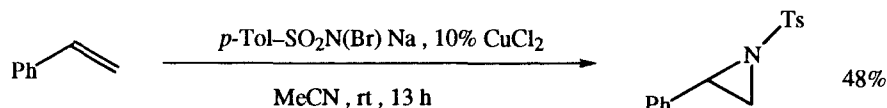
Abdo, T.; Kano, D.; Minakata, S.; Ryu, I.; Komatsu, M. *Tetrahedron*, **1998**, 54, 13485.



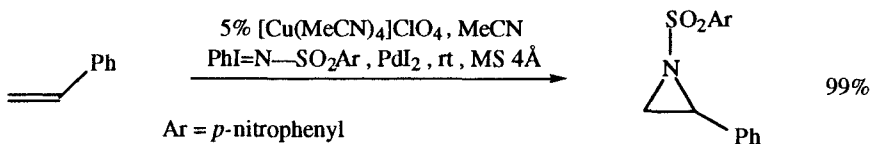
Jeong, J.U.; Tao, B.; Sagasser, I.; Henniges, H.; Sharpless, K.B. *J. Am. Chem. Soc.*, **1998**, 120, 6844.



Ando, T.; Minakata, S.; Ryu, I.; Komatsu, M. *Tetrahedron Lett.*, **1998**, 39, 309.



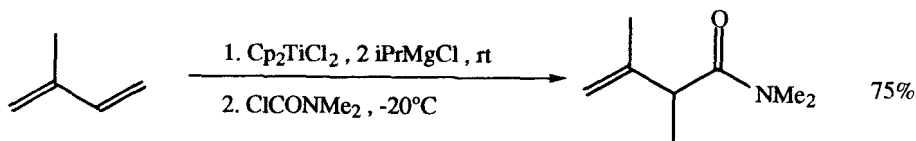
Vyas, R.; Chanda, B.M.; Bedekar, A.V. *Tetrahedron Lett.*, **1998**, 39, 4715.



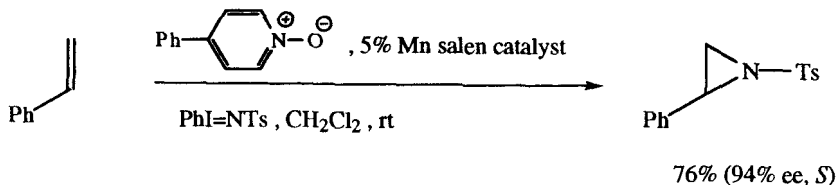
Ar = *p*-nitrophenyl

Södergren, M.J.; Alonso, D.A.; Bedekar, A.V.; Andersson, P.G. *Tetrahedron Lett.* **1997**, 38, 6897.



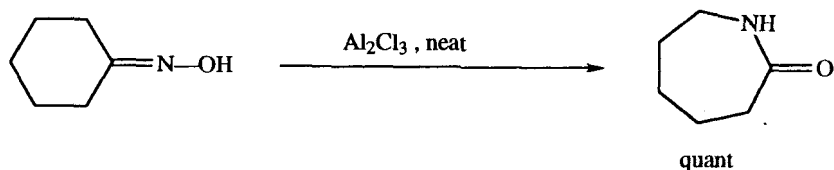


Szymoniak, K.; Felix, D.; Moise, C. *Tetrahedron Lett.*, **1996**, 37, 6603.

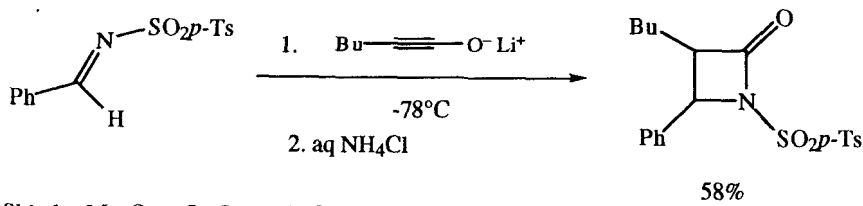


Nishikori, H.; Katsuki, T. *Tetrahedron Lett.*, **1996**, 37, 9245.

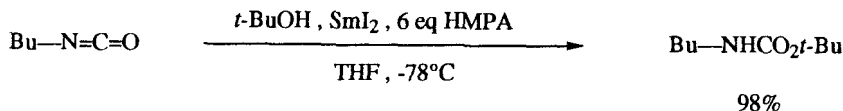
## SECTION 90: AMIDES FROM MISCELLANEOUS COMPOUNDS



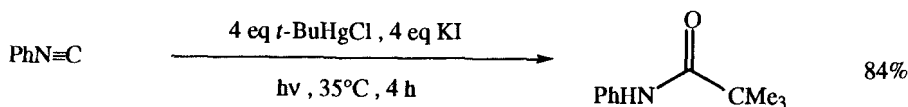
Ghiaci, M.; Imanzadeh, G.H. *Synth. Commun.*, **1998**, 28, 2275.



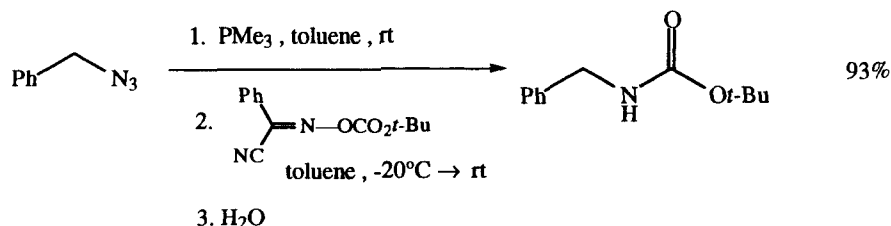
Shindo, M.; Oya, S.; Sato, Y.; Shishido, K. *Heterocycles*, **1998**, 49, 113.



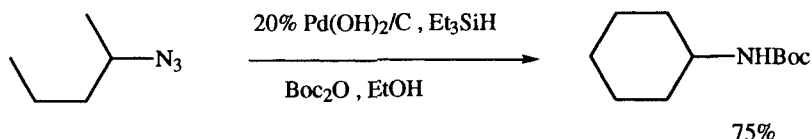
Kim, Y.H.; Park, H.S. *SynLett*, **1998**, 261.



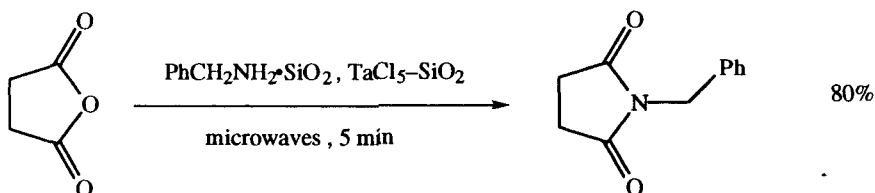
Russell, G.A.; Rajaratnam, R.; Chen, P. *Acta Chem. Scand. B*, **1998**, 52, 528.



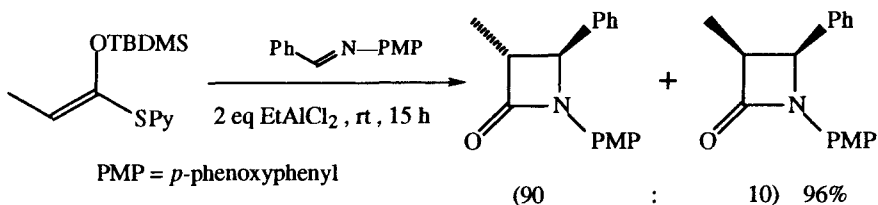
Arizo, X.; Urpí, E.; Viladomat, C.; Viularrasa, J. *Tetrahedron Lett.*, **1998**, 39, 9101.



Kotsuki, H.; Ohishi, T.; Araki, T. *Tetrahedron Lett.*, **1997**, 38, 2129.

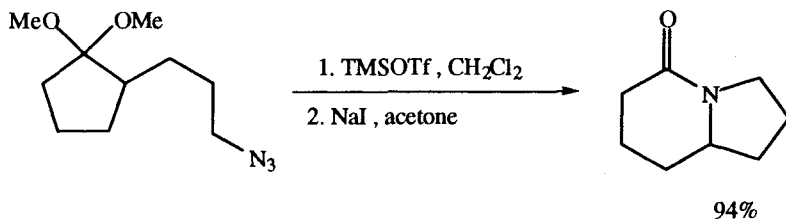


Chandrasekhar, S.; Jakhi, M.; Uma, G. *Tetrahedron Lett.*, **1997**, 38, 8089.

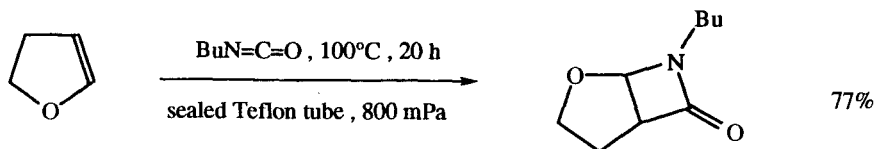
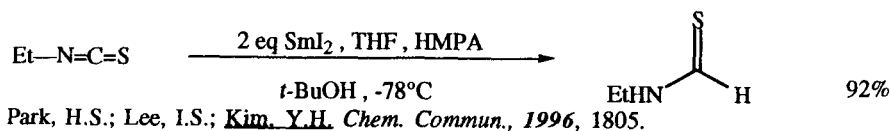


Annunziata, R.; Cinquini, M.; Cozzi, E.; Molteni, V.; Schupp, O. *Tetrahedron*, **1996**, 52, 2573

Annunziata, R.; Benaglia, M.; Cinquini, M.; Cozzi, E.; Martini, O.; Molteni, V. *Tetrahedron*, **1996**, 52, 2583.

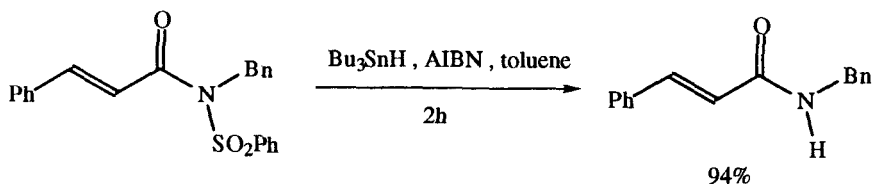
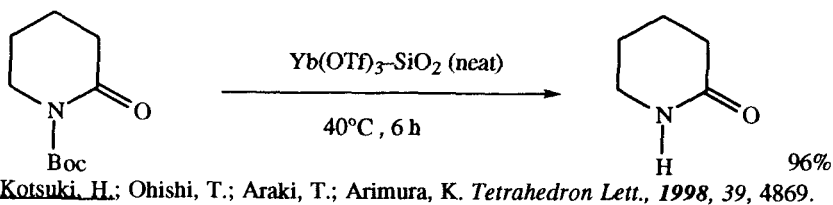


Mossman, C.J.; Aubé, J. *Tetrahedron*, **1996**, 52, 3403.



Taguchi, Y.; Tsuchiya, T.; Oishi, A.; Shibuya, I. *Bull. Chem. Soc. Jpn.*, 1996, 69, 1667.

## SECTION 90A: PROTECTION OF AMIDES

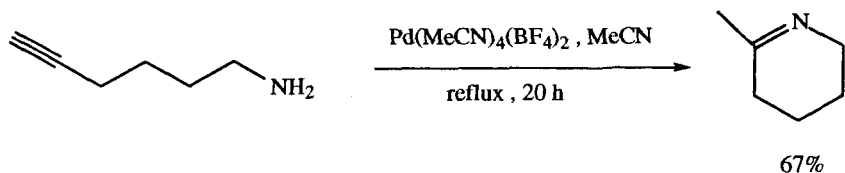


Parsons, A.E.; Pettifer, R.M. *Tetrahedron Lett.*, 1996 37, 1667.

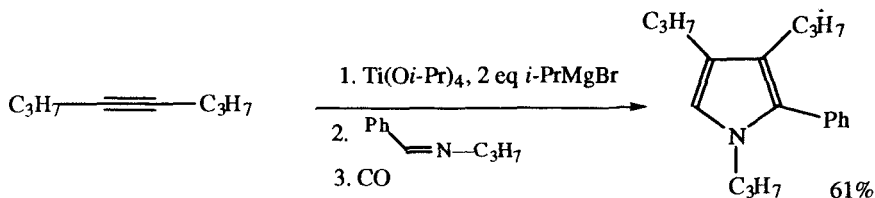
## CHAPTER 7

# PREPARATION OF AMINES

### SECTION 91: AMINES FROM ALKYNES



Müller, T.E. *Tetrahedron Lett.*, **1998**, 39, 5961.



Gao, Y.; Shirai, M.; Sato, F. *Tetrahedron Lett.*, **1996**, 37, 7787.

### SECTION 92: AMINES FROM ACID DERIVATIVES

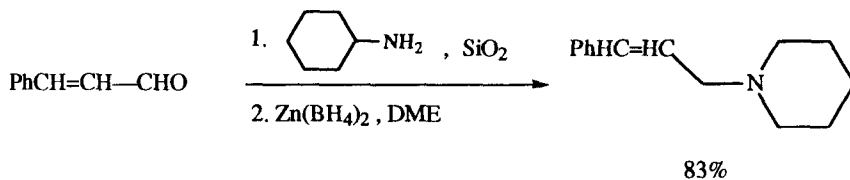
NO ADDITIONAL EXAMPLES

### SECTION 93: AMINES FROM ALCOHOLS AND THIOLS

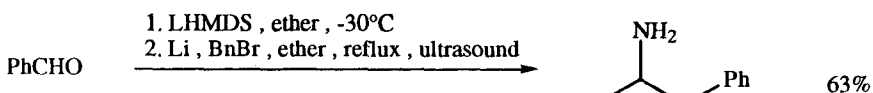
NO ADDITIONAL EXAMPLES

### SECTION 94: AMINES FROM ALDEHYDES

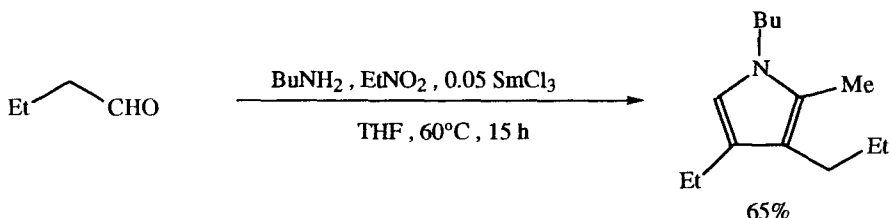
Related Methods: Section 102 (Amines from Ketones)



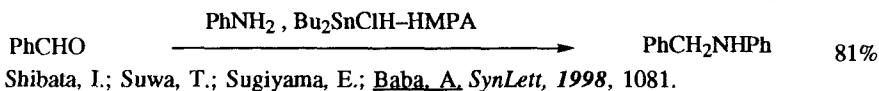
Ranu, B.C.; Majee, A.; Sarkar, A. *J. Org. Chem.*, **1998**, 63, 370.



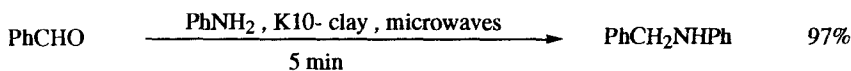
Gyenes, F.; Bergmann, K.E.; Welch, J.T. *J. Org. Chem.*, **1998**, 63, 2824.



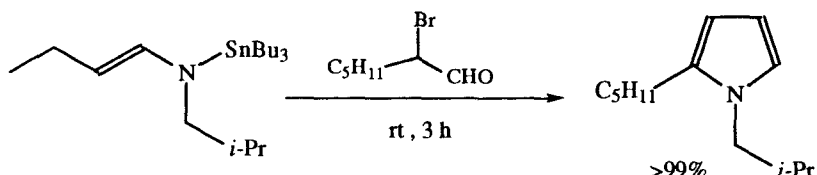
Shiraishi, H.; Nishitani, T.; Sakaguchi, S.; Ishii, Y. *J. Org. Chem.*, **1998**, 63, 6234.



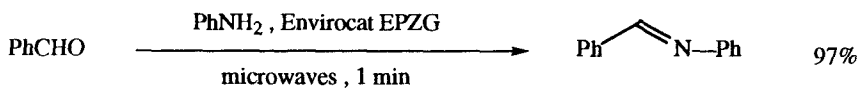
Shibata, I.; Suwa, T.; Sugiyama, E.; Baba, A. *SynLett*, **1998**, 1081.



Varma, R.S.; Dahiya, R. *Tetrahedron*, **1998**, 54, 6293.



Yasuda, M.; Morimoto, J.; Shibata, I.; Baba, A. *Tetrahedron Lett.*, **1997**, 38, 3265.

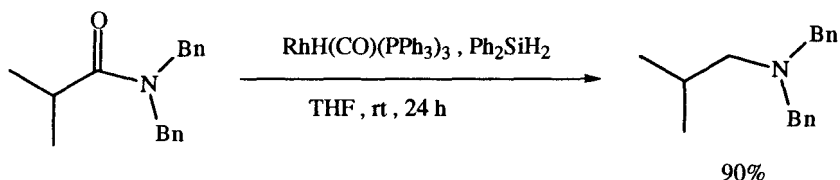


Varma, R.S.; Dahiya, R. *SynLett*, **1997**, 1245.

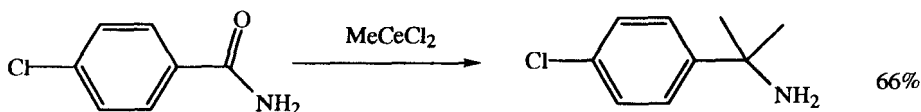
## SECTION 95: AMINES FROM ALKYL, METHYLENES AND ARYL

NO ADDITIONAL EXAMPLES

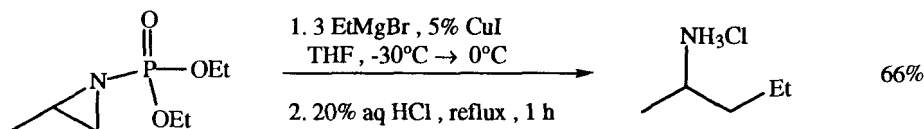
## SECTION 96: AMINES FROM AMIDES



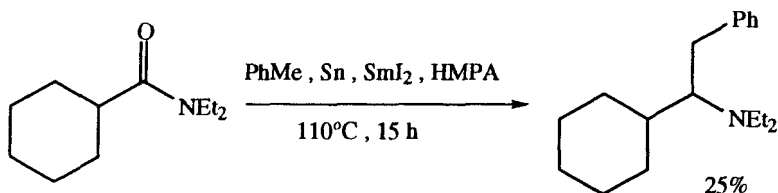
Kuwano, R.; Takahashi, M.; Ito, Y. *Tetrahedron Lett.*, **1998**, 39, 1017.



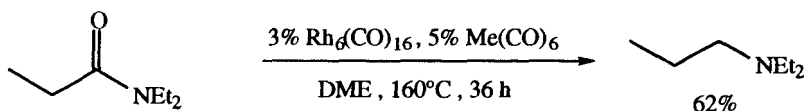
Calderwood, D.I.; Davies, R.V.; Rafferty, P.; Twigger, H.L.; Whelan, H.M. *Tetrahedron Lett.*, **1997**, 38, 1241.



Gajda, T.; Napieraj, A.; Osowska-Pacewicka, K.; Zawadzki, S.; Zwierzak, A. *Tetrahedron*, **1997**, 53, 4935.



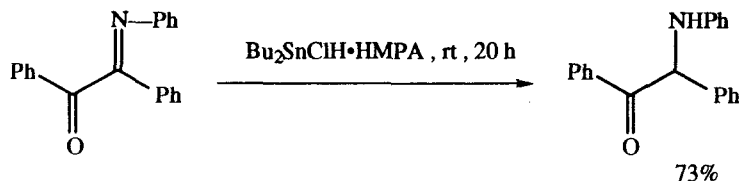
Ogawa, A.; Takami, N.; Nanke, T.; Ohya, S.; Hirao, T.; Sonoda, N. *Tetrahedron*, **1997**, 53, 12895.



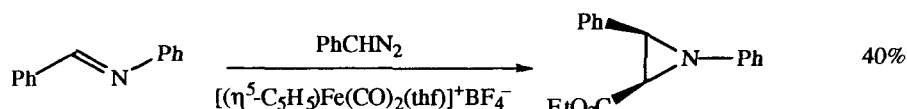
Hirosawa, C.; Wakasa, N.; Fuchikami, T. *Tetrahedron Lett.*, **1996**, 37, 6749.

Related Methods: Section 105A (Protection of Amines)

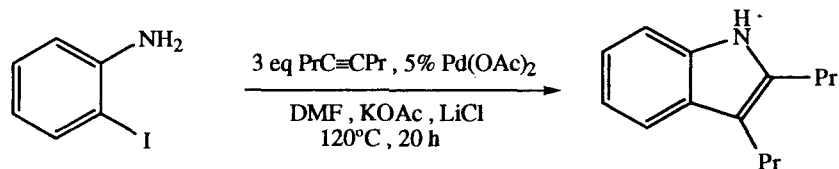
## SECTION 97: AMINES FROM AMINES



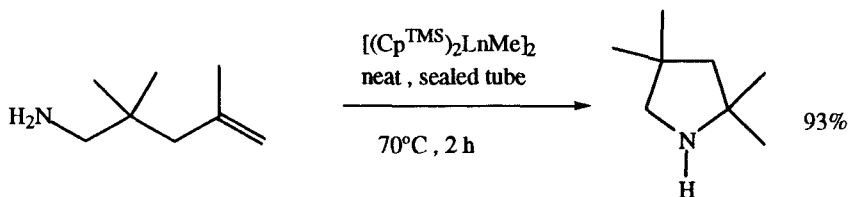
Shibata, I.; Moriuchi-Kawakami, T.; Tankzawa, D.; Suwa, T.; Sugiyama, E.; Matsuda, H.; Baba, A. *J. Org. Chem.*, **1998**, 63, 383.



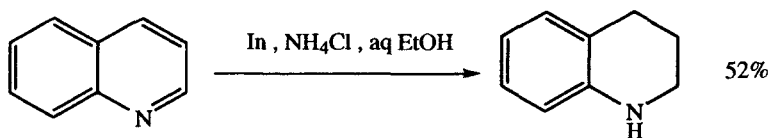
Mayer, M.F.; Hossain, M.M. *J. Org. Chem.*, **1998**, 63, 6839.



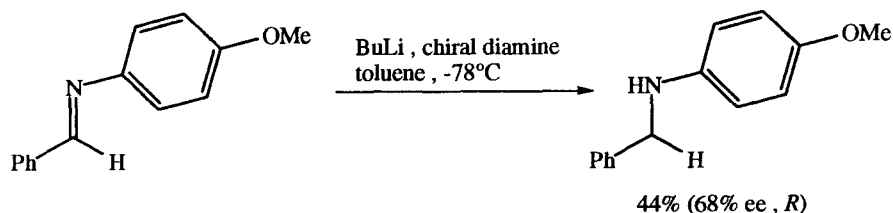
Larock, R.C.; Yum, E.K.; Refvik, M.D. *J. Org. Chem.*, **1998**, 63, 7652.



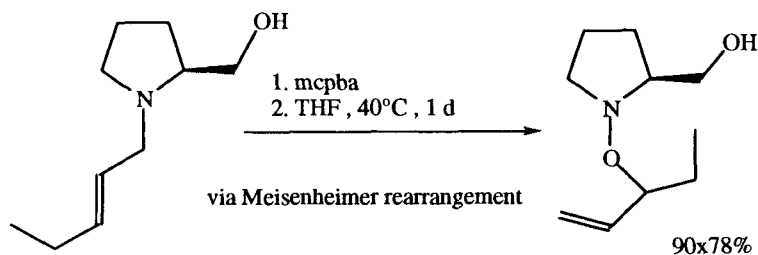
Molander, G.A.; Dowdy, E.D. *J. Org. Chem.*, **1998**, 63, 8983.



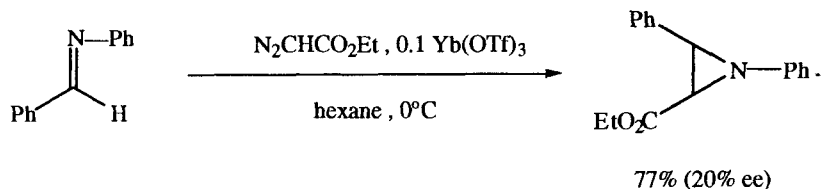
Moody, C.J.; Pitts, M.R. *SynLett*, **1998**, 1029.



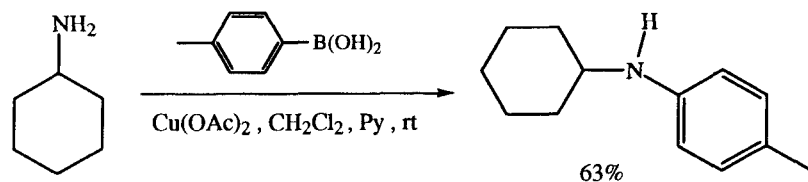
Andersson, P.G.; Johansson, F.; Tanner, D. *Tetrahedron*, **1998**, *54*, 11549.



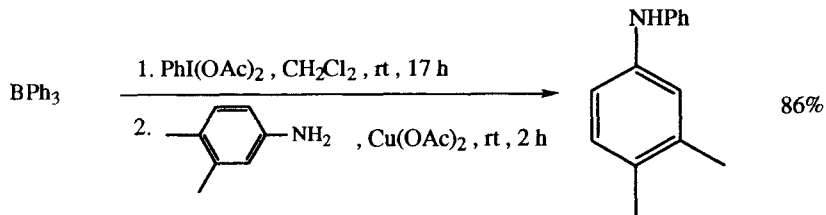
Buston, J.E.H.; Coldham, I.; Mulholland, K.R. *Tetrahedron Asymmetry*, **1998**, *9*, 1995.



Nagayama, S.; Kobayashi, S. *Chem. Lett.*, **1998**, 685.

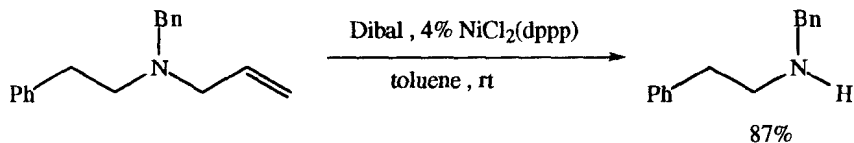


Chan, D.M.T.; Monaco, K.L.; Wang, R.-P.; Winters, M.P. *Tetrahedron Lett.*, **1998**, *39*, 2937

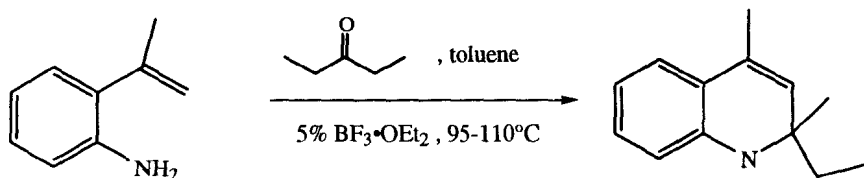


Combes, S.; Finet, J.-P. *Tetrahedron*, **1998**, *54*, 4313.

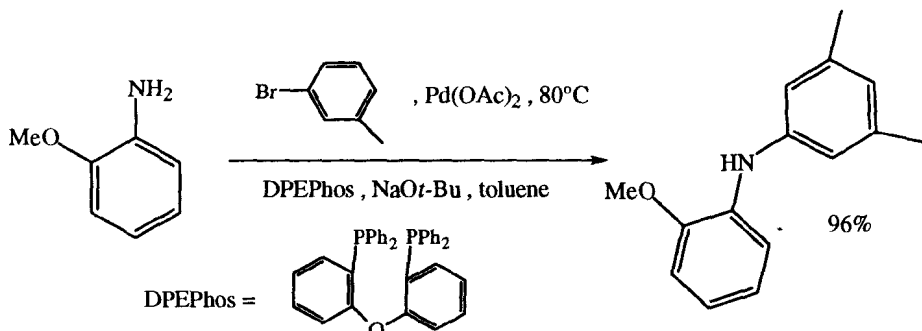




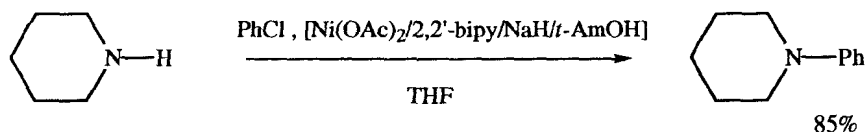
Taniguchi, T.; Ogasawara, K. *Tetrahedron Lett.*, **1998**, 39, 4679.



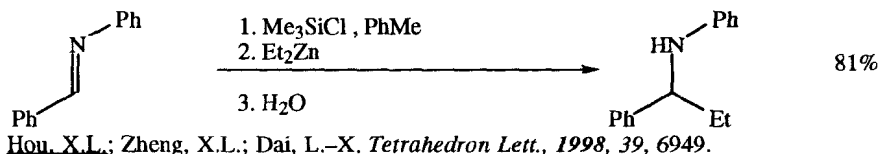
Edwards, J.P.; Ringgenberg, J.D.; Jones, T.K. *Tetrahedron Lett.*, **1998**, 39, 5139.



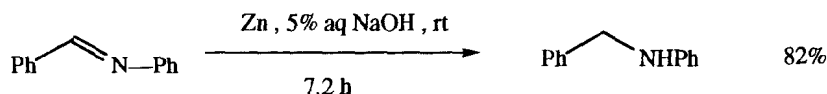
Sadighi, J.P.; Harris, M.C.; Buchwald, S.L. *Tetrahedron Lett.*, **1998**, 39, 5327.



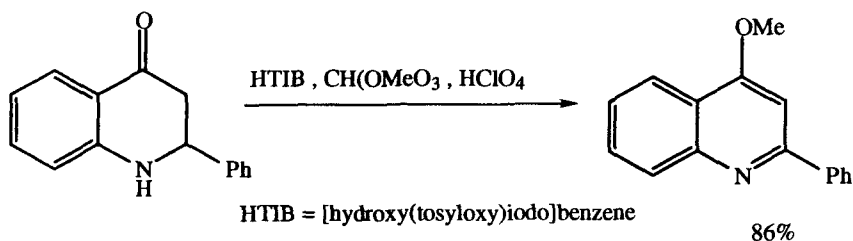
Brenner, E.; Fort, Y. *Tetrahedron Lett.*, **1998**, 39, 5359.



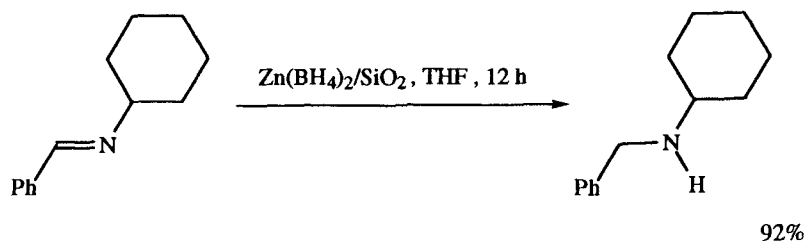
Hou, X.L.; Zheng, X.L.; Dai, L.-X. *Tetrahedron Lett.*, **1998**, 39, 6949.



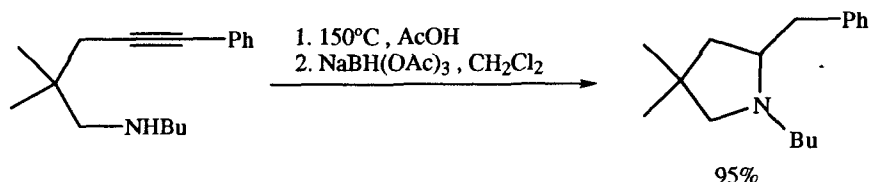
Tsukinoki, T.; Mitoma, Y.; Nagashima, S.; Kawaji, T.; Hashimoto, I.; Tashiro, M. *Tetrahedron Lett.*, **1998**, 39, 8873.



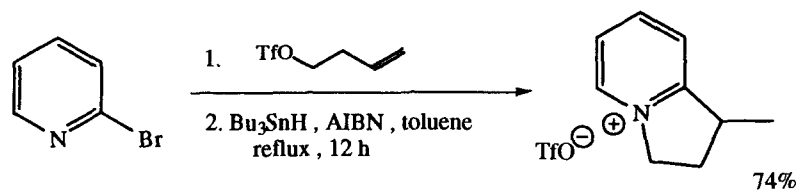
Varma, R.S.; Kumar, D. *Tetrahedron Lett.*, **1998**, 39, 9113.



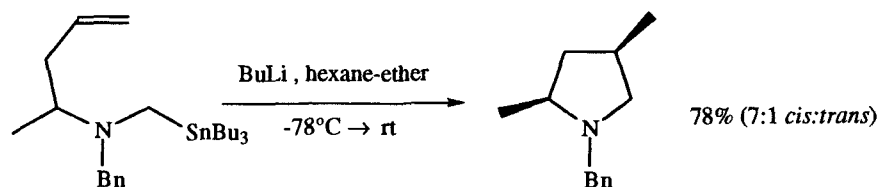
Ranu, B.C.; Sarkar, A.; Majee, A. *J. Org. Chem.*, **1997**, 62, 1841.



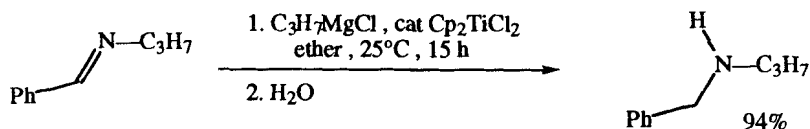
Cossy, J.; Belotti, D.; Bellosta, V.; Boggio, C. *Tetrahedron Lett.*, **1997**, 38, 2677.



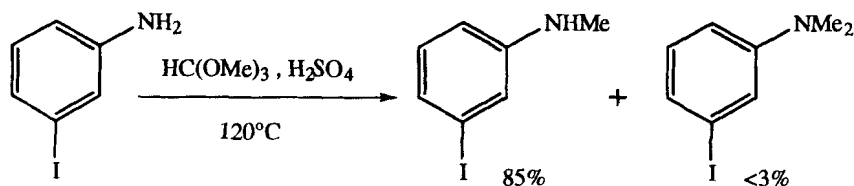
Dobbs, A.P.; Jones, K.; Veal, K.T. *Tetrahedron Lett.*, **1997**, 38, 5383.



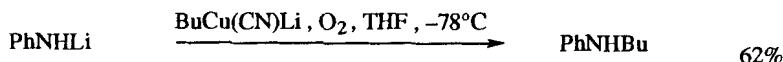
Coldham, I.; Hufton, R.; Rathmell, R.E. *Tetrahedron Lett.*, **1997**, 38, 7617.



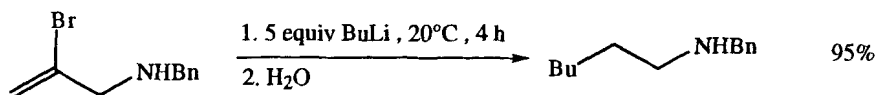
Amin, S.K.R.; Crowe, W.E. *Tetrahedron Lett*, **1997**, 38, 7487.



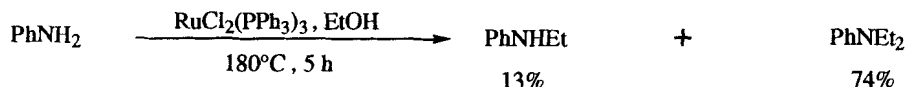
Padmanabhan, S.; Reddy, N.L.; Durant, G.J. *Synth. Commun.*, **1997**, 27, 695.



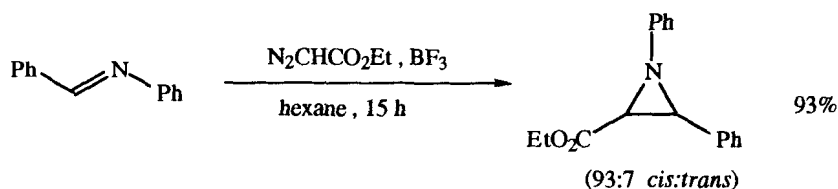
Alberti, A.; Canè, F.; Dembech, P.; Lazzari, D.; Ricci, A.; Seconi, G. *J. Org. Chem.*, **1996**, 61, 1677.



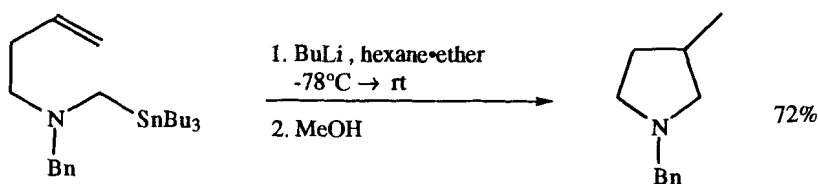
Barluenga, J.; Cantel, R.-M.; Flórez, J. *J. Org. Chem.*, **1996**, 61, 3646.



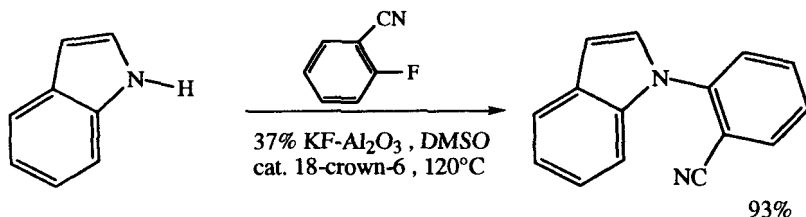
Watanabe, Y.; Morisaki, Y.; Kondo, T.; Mitsudo, T. *J. Org. Chem.*, **1996**, 61, 4214.



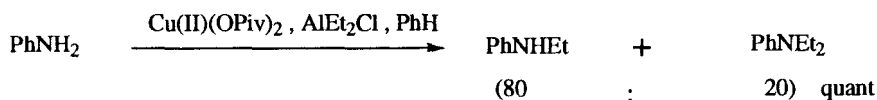
Casarrubios, L.; Pérez, J.A.; Brookhart, M.; Templeton, J.L. *J. Org. Chem.*, **1996**, 61, 8358



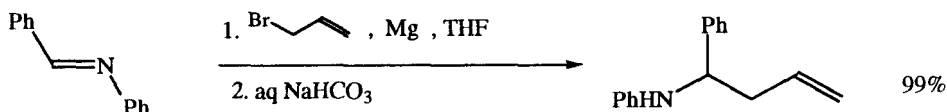
Coldham, I.; Hufton, R.; Snowden, D.J. *J. Am. Chem. Soc.*, **1996**, 118, 5322.



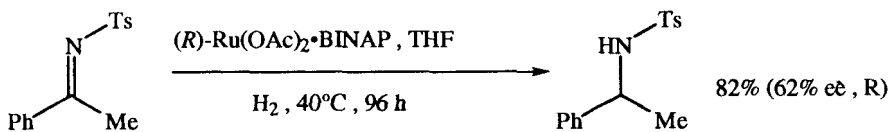
Smith III, W.J.; Sawyer, J.S. *Tetrahedron Lett.*, **1996**, 37, 299.



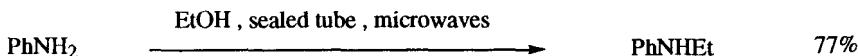
Barton, D.H.R.; Doris, E. *Tetrahedron Lett.*, **1996**, 37, 3295.



Wang, D.-k.; Dai, L.-X.; Hou, X.-L.; Zhang, Y. *Tetrahedron Lett.*, **1996**, 37, 4187.

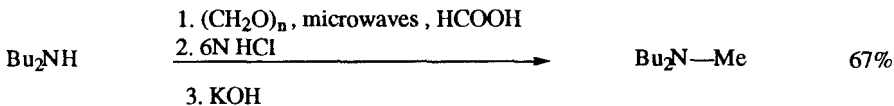


Charette, A.B.; Giroux, A. *Tetrahedron Lett.*, **1996**, 37, 6669.

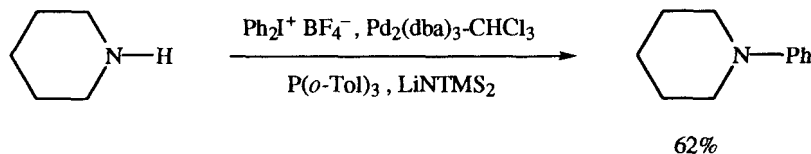


Jiang, Y.-L.; Hu, Y.-Q.; Feng, S.-Q.; Wu, J.-S.; Wu, Z.W.; Yuan, Y.-C.; Liu, J.-M.; Hao, Q.-S.; Li, D.-P.; Yuan, Y.-C.; Liu, J.-M.; Hao, Q.-S.; Li, D.-P.

*Synth. Commun.*, **1996**, 26, 161.

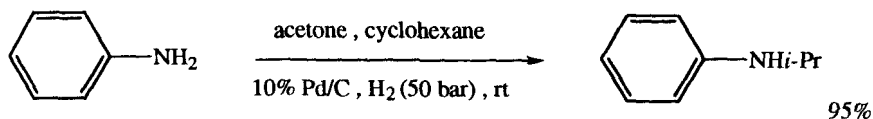


Barbry, D.; Torchy, S. *Synth. Commun.*, **1996**, 26, 3919.

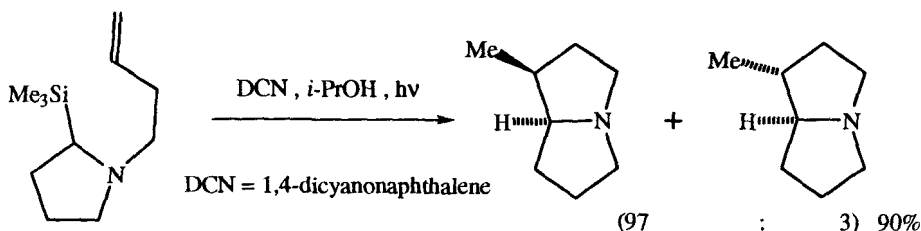


Kang, S.-K.; Lee, H.-W.; Choi, W.-K.; Hong, R.-K.; Kin, J.-S.

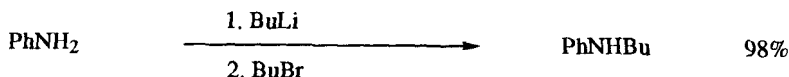
*Synth. Commun.*, **1996**, 26, 4219.



Fache, F.; Valot, F.; Milenkovic, A.; LeMaire, M. *Tetrahedron*, **1996**, 52, 9777.

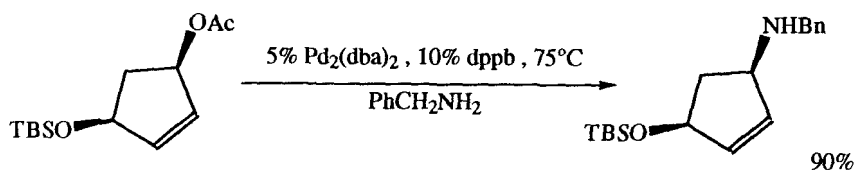


Pandey, G.; Reddy, G.D.; Chakrabarti, D. *J. Chem. Soc., Perkin Trans. 1*, **1996**, 219.



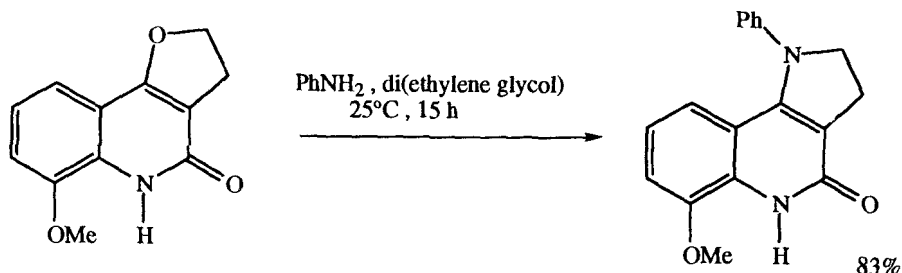
Vitale, A.A.; Chioconni, A.A. *J. Chem. Res. (S)*, **1996**, 336.

## SECTION 98: AMINES FROM ESTERS

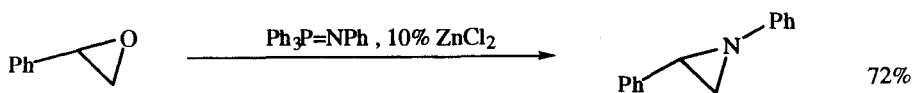


Sirisoma, N.S.; Woster, P.M. *Tetrahedron Lett.*, **1998**, 39, 1489.

## SECTION 99: AMINES FROM ETHERS, EPOXIDES AND THIOETHERS

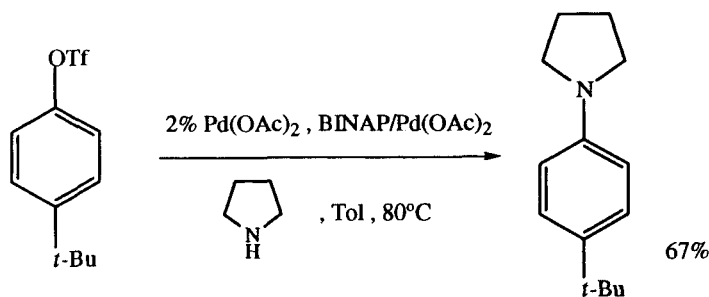


Kim, S.S.; Cheon, H.G.; Kang, S.K.; Yum, E.K.; Choi, J.-K. *Heterocycles*, **1998**, 48, 221.

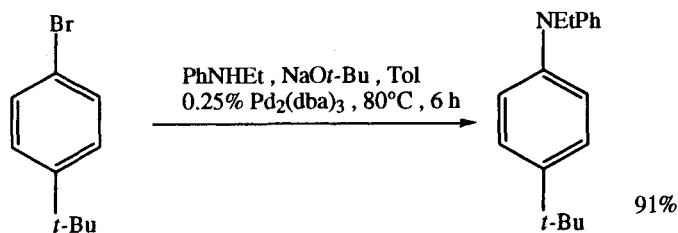


Kühnau, D.; Thomsen, I.; Jørgensen, K.A. *J. Chem. Soc., Perkin Trans. 1*, **1996**, 1167.

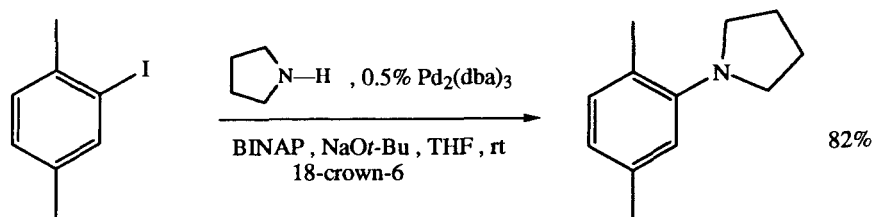
## SECTION 100: AMINES FROM HALIDES AND SULFONATES



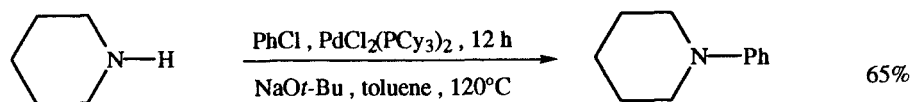
Wolfe, J.P.; Buchwald, S.L. *J. Org. Chem.*, **1997**, 62, 1264.



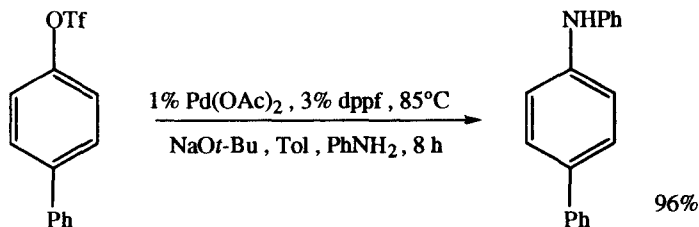
Marcoux, J.-F.; Wagaw, S.; Buchwald, S.L. *J. Org. Chem.*, **1997**, 62, 1568.



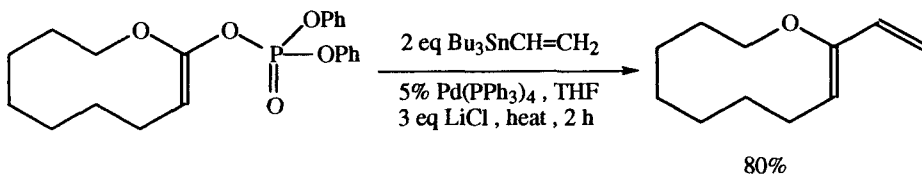
Wolfe, J.P.; Buchwald, S.L. *J. Org. Chem.*, **1997**, 62, 6066.



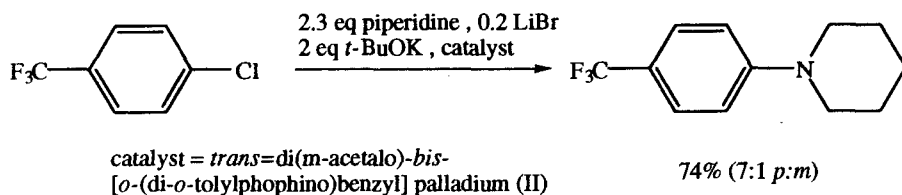
Reddy, N.P.; Tanaka, M. *Tetrahedron Lett.*, **1997**, 38, 4807.



Louie, J.; Driver, M.S.; Hamann, B.C.; Hartwig, J.E., *J. Org. Chem.*, **1997**, 62, 1268.

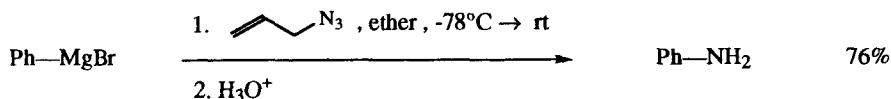


Nicolaou, K.C.; Shi, G.-Q.; Gunzner, J.L.; Gärtner, P.; Yang, Z.  
*J. Am. Chem. Soc.*, **1997**, 119, 5467.

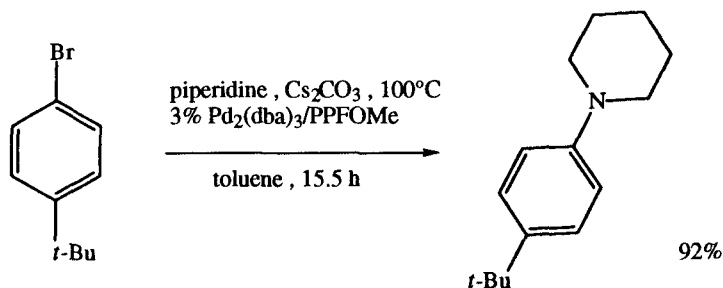


catalyst = *trans*-di(*m*-acetalo)-*bis*-  
[*o*-(*di*-*o*-tolylphosphino)benzyl] palladium (II)

Beller, M.; Riermeier, T.H.; Reisinger, C.-P.; Herrmann, W.A.  
*Tetrahedron Lett.*, **1997**, 38, 2073.

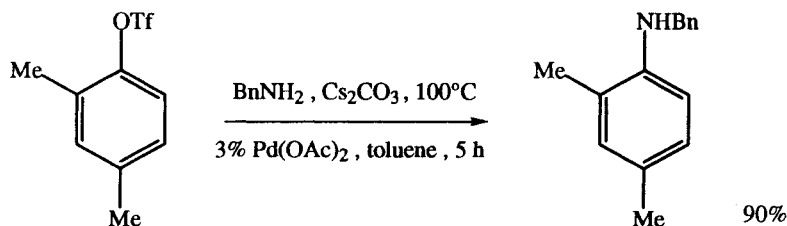


Kabalka, G.W.; Li, G. *Tetrahedron Lett.*, **1997**, 38, 5777.

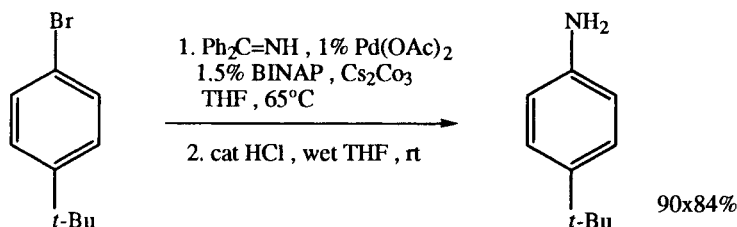


$\text{PPFOMe} = 1\text{-}[2\text{-(diphenylphosphino)ferrocenyl}]\text{ethyl methyl ether}$

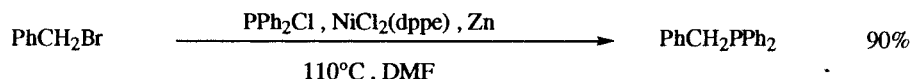
Wolfe, J.P.; Buchwald, S.L., *Tetrahedron Lett.*, **1997**, 38, 6359.



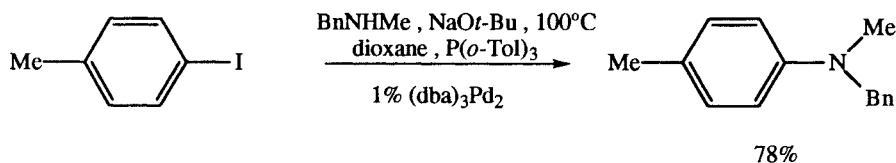
Åhman, J.; Buchwald, S.L. *Tetrahedron Lett.*, **1997**, 38, 6363.



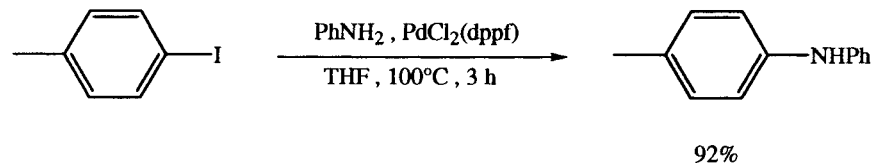
Wolfe, J.P.; Åhman, J.; Sadighi, J.P.; Singer, R.A.; Buchwald, S.L. *Tetrahedron Lett.*, **1997**, 38, 6367.



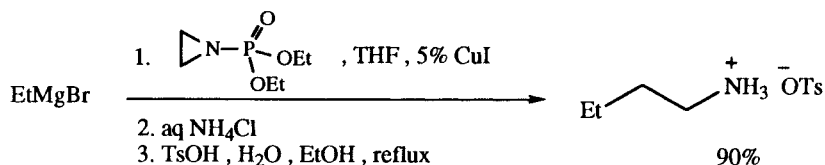
Ager, D.J.; East, M.B.; Eisenstadt, A.; Laneman, S.A. *Chem. Commun.*, **1997**, 2359.



Wolfe, J.P.; Buchwald, S.L. *J. Org. Chem.*, **1996**, 61, 1133.



Driver, M.S.; Hartwig, J.F. *J. Am. Chem. Soc.*, **1996**, 118, 7217.



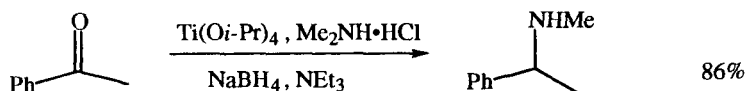
Osowska-Pacewicka, K.; Zwierzak, A. *Synthesis*, **1996**, 333.



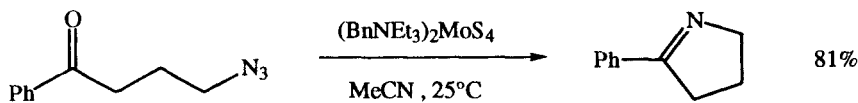
## SECTION 101: AMINES FROM HYDRIDES

NO ADDITIONAL EXAMPLES

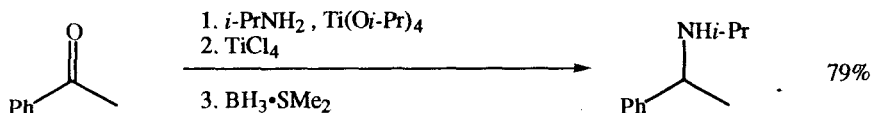
## SECTION 102: AMINES FROM KETONES



Neidigh, K.A.; Avery, M.A.; Williamson, J.S.; Bhattacharyya, S.  
*J. Chem. Soc., Perkin Trans. 1*, **1998**, 2527.



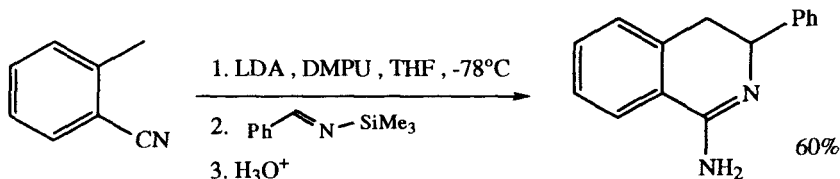
Prabhu, K.P.; Sivanand, P.S.; Chandrasekaran, S. *SynLett*, **1998**, 47.



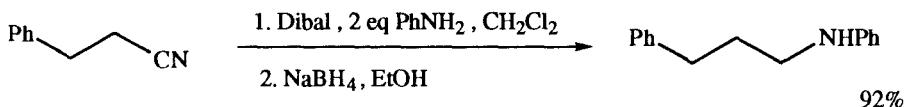
Johansson, A.; Lindstedt, E.-L.; Olsson, T. *Acta Chem. Scand. B*, **1997**, 51, 351.

Related Methods: Section 94 (Amines from Aldehydes)

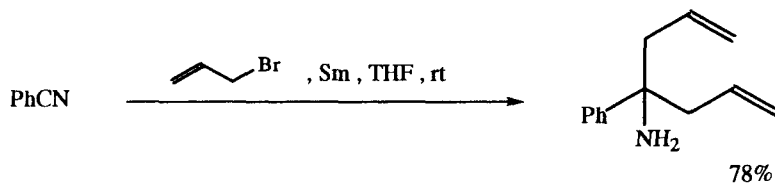
## SECTION 103: AMINES FROM NITRILES



Baeton, H.; Hamley, P.; Tinker, A.C. *Tetrahedron Lett.*, **1998**, 39, 1227.

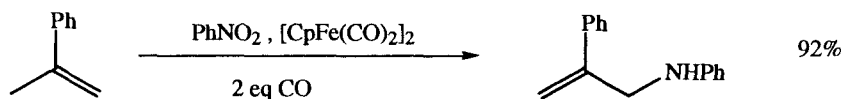


Barmore, R.M.; Logan, S.R.; Van Wagenen, B.C. *Tetrahedron Lett.*, **1998**, 34, 3451.

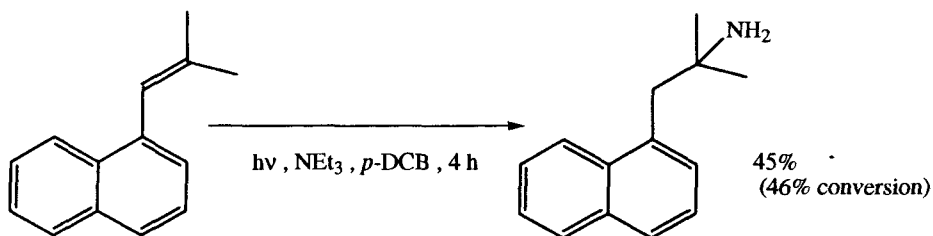


Yu, M.; Zhang, Y.; Guo, H. *Synth. Commun.*, **1997**, 27, 1495.

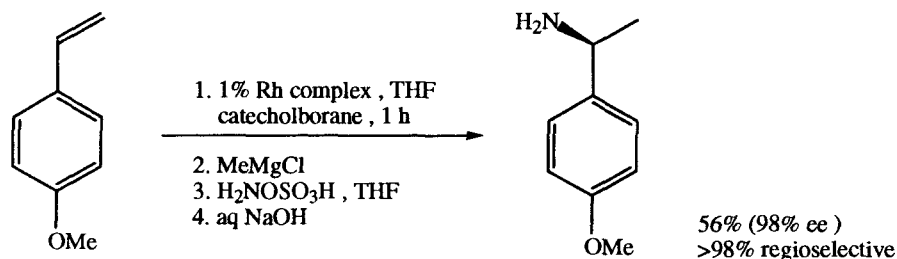
## SECTION 104: AMINES FROM ALKENES



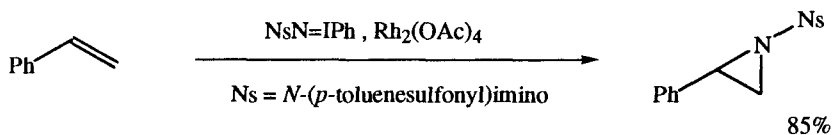
Srivastava, R.S.; Nicholas, K.M. *Chem. Commun.*, **1998**, 2705.



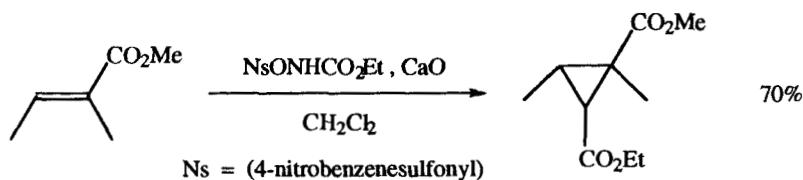
Yasuda, M.; Kojima, R.; Ohira, R.; Shiragami, T.; Shima, K.  
*Bull. Chem. Soc. Jpn.*, **1998**, 71, 1655.



Fernandez, E.; Hooper, M.W.; Knight, F.I.; Brown, J.M. *Chem. Commun.*, **1997**, 173.

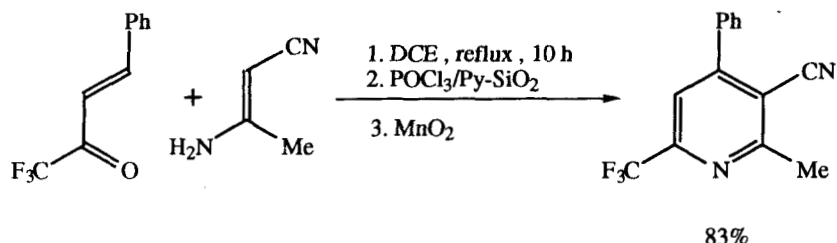
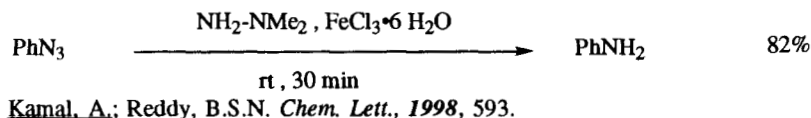
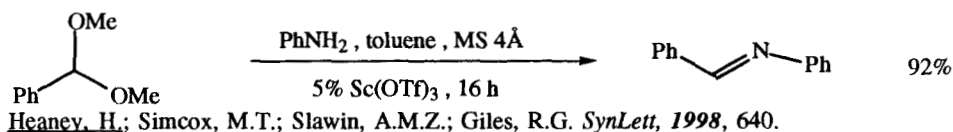


Müller, P.; Baud, C.; Jacquier, Y. *Tetrahedron*, **1996**, 52, 1543.

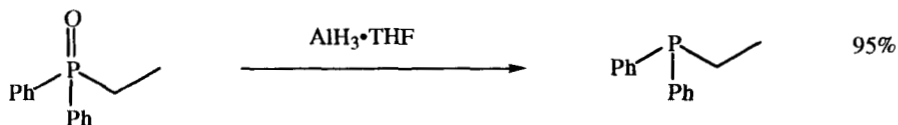


Carducci, M.; Fioravanti, S.; Loreto, M.A.; Pellacani, L.; Tardella, P.A.  
*Tetrahedron Lett.*, **1996**, 37, 3777.

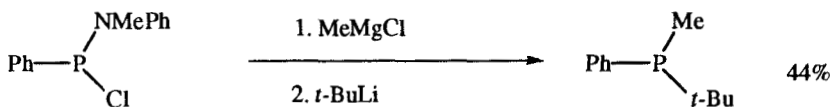
## SECTION 105: AMINES FROM MISCELLANEOUS COMPOUNDS



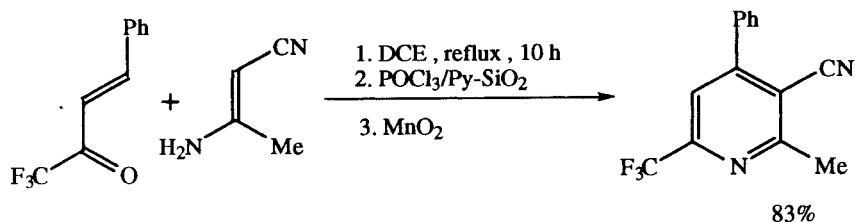
Katsuyama, I.; Ogawa, S.; Nakamura, H.; Yamaguchi, Y.; Funabiki, K.; Matsui, M.;  
 Muramatsu, H.; Shibata, K. *Heterocycles*, **1998**, 48, 779.



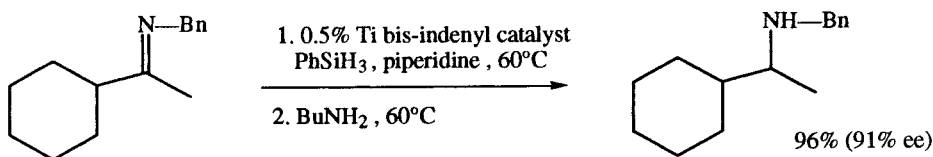
Griffin, S.; Heath, L.; Wyatt, P. *Tetrahedron Lett.*, **1998**, 39, 4405.



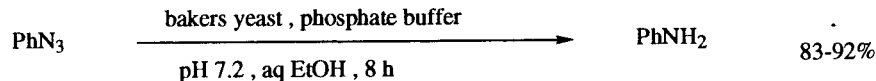
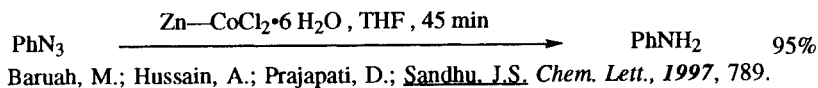
Singh, S.; Nicholas, K.M. *Chem. Commun.*, **1998**, 149.



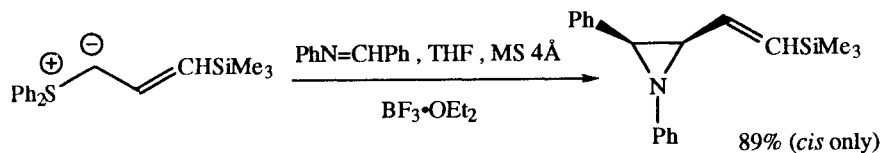
Katsuyama, I.; Ogawa, S.; Nakamura, H.; Yamaguchi, Y.; Funabiki, K.; Matsui, M.; Muramatsu, H.; Shibata, K. *Heterocycles*, **1998**, *48*, 779.



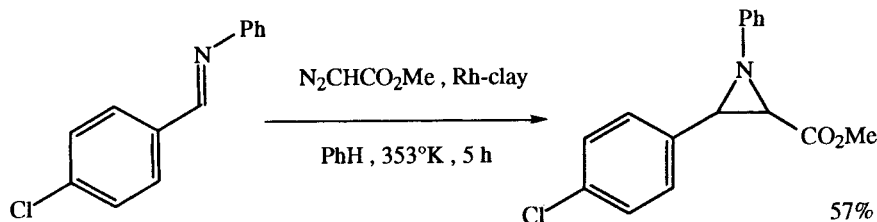
Verdaguer, X.; Lange, U.E.W.; Buchwald, S.L. *Angew. Chem. Int. Ed.*, **1998**, *37*, 1103.



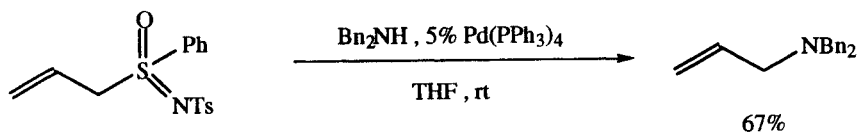
Kamal, A.; Damayanthi, Y.; Reddy, B.S.N.; Lakminarayana, B.; Reddy, B.S.P. *Chem. Commun.*, **1997**, 1015.



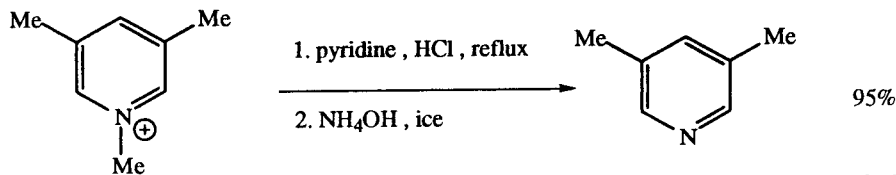
Wang, D.-K.; Dai, L.-X.; Hou, X.-L. *Chem. Commun.*, **1997**, 1231.



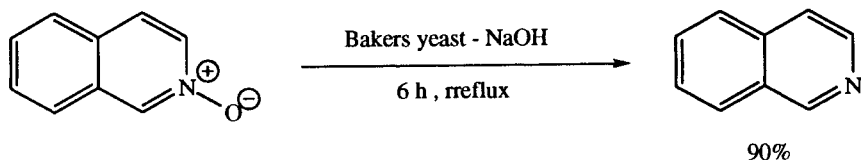
Mohan, J.M.; Uphade, T.S.S.; Choudhary, V.R.; Ravindranathan, T.; Sudalai, A. *Chem. Commun.*, **1997**, 1429.



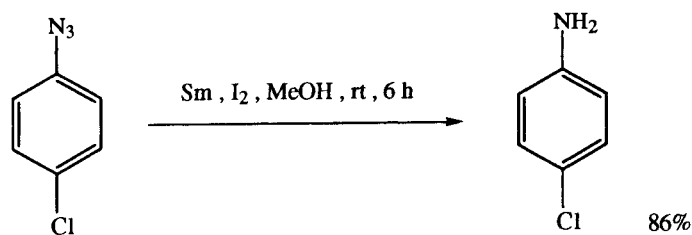
Pyne, S.G.; O'Meara, G.; David, D.M. *Tetrahedron Lett.*, **1997**, 38, 3623.



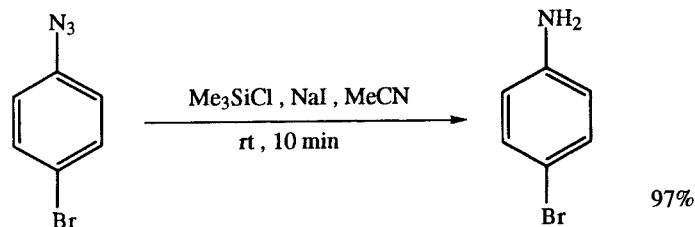
Ruiz, A.; Rocca, P.; Marsais, F.; Godard, A.; Quéguiner, G. *Tetrahedron Lett.*, **1997**, 38, 6205



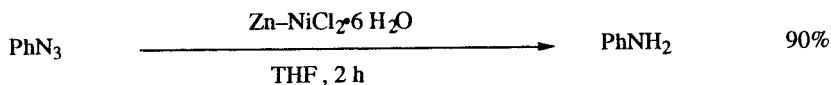
Baik, W.; Kim, D.I.; Koo, S.; Rhee, J.U.; Shin, S.H.; Kim, B.H. *Tetrahedron Lett.*, **1997**, 38, 845.



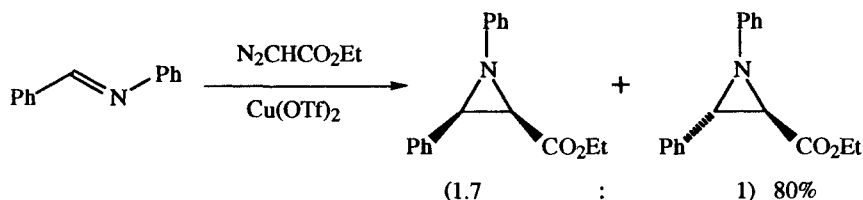
Huang, Y.; Zhang, Y.; Wang, Y. *Tetrahedron Lett.*, **1997**, 38, 1065.



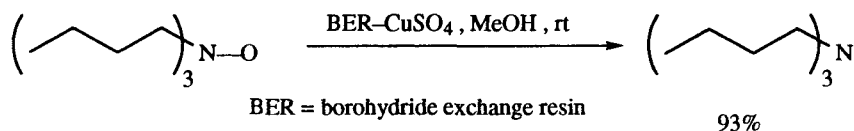
Kamal, A.; Rao, N.V.; Laxman, E. *Tetrahedron Lett.*, **1997**, 38, 6945.



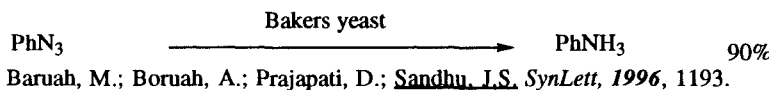
Boruah, A.; Baruah, M.; Prajapati, D.; Sandhu, J.S. *SynLett*, **1997**, 1253.



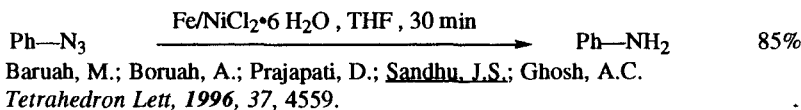
Rasmussen, K.G.; ~~Jørgensen, K.A.~~ *J. Chem. Soc., Perkin Trans. 1*, **1997**, 1287.



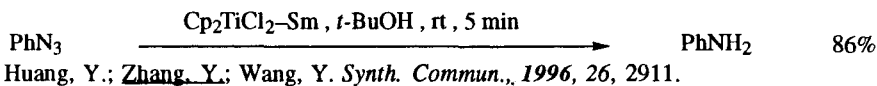
Sim, T.B.; Ahn, J.H.; Yoon, N.M. *Synthesis*, **1996**, 324.



Baruah, M.; Boruah, A.; Prajapati, D.; Sandhu, J.S. *SynLett*, **1996**, 1193.

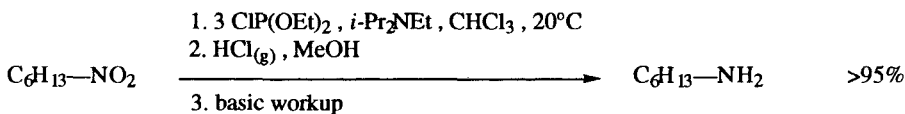


Baruah, M.; Boruah, A.; Prajapati, D.; Sandhu, J.S.; Ghosh, A.C. *Tetrahedron Lett*, **1996**, 37, 4559.

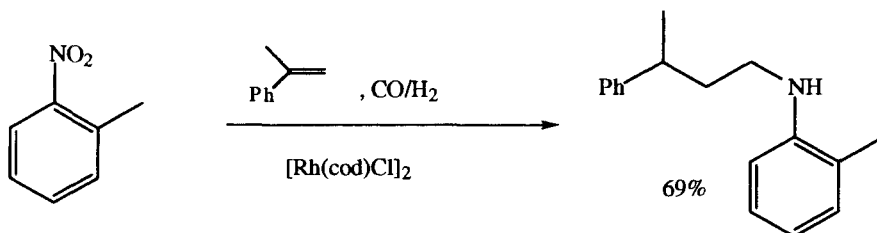


Huang, Y.; Zhang, Y.; Wang, Y. *Synth. Commun.*, **1996**, 26, 2911.

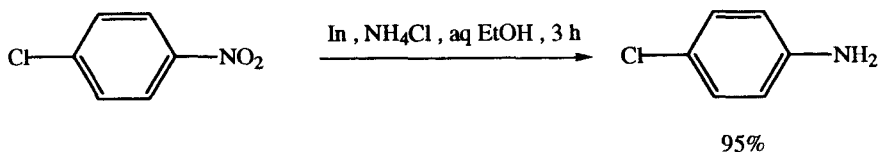
### AMINES FROM NITRO COMPOUNDS



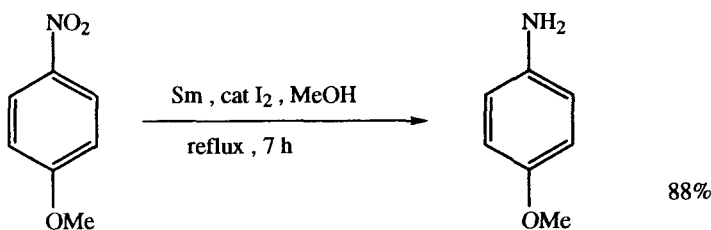
Fischer, B.; Sheihet, L. *J. Org. Chem.*, **1998**, 63, 393.



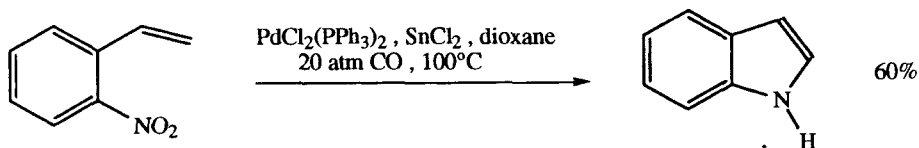
Rische, T.; Eilbracht, P. *Tetrahedron*, **1998**, 54, 8441.



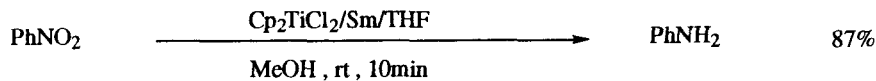
Moody, C.J.; Pitts, M.R. *SynLett*, **1998**, 1028.



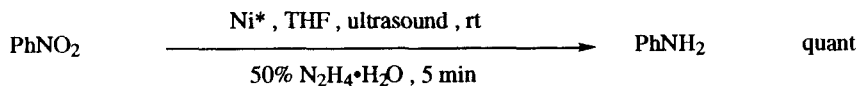
Banik, B.K.; Mukhopadhyay, C.; Venkatraman, M.S.; Becker, F.F. *Tetrahedron Lett*, **1998**, 39, 7243.



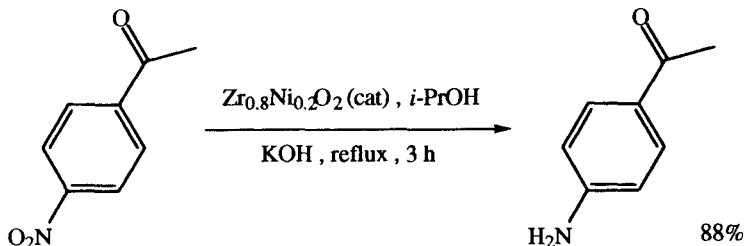
Söderberg, B.C.; Shriver, J.A. *J. Org. Chem.*, **1997**, 62, 5838.



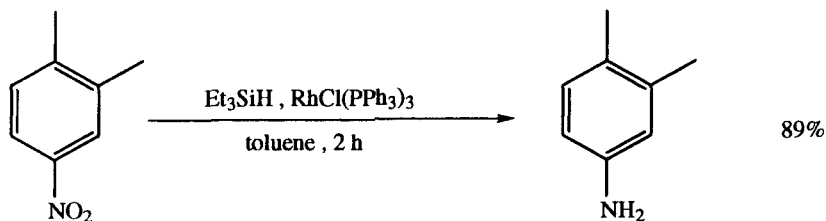
Huang, Y.; Liao, P.; Zhang, Y.; Wang, Y. *Synth. Commun.*, **1997**, 27, 1059.



Li, H.; Zhang, R.; Wang, H.; Pan, Y.; Shi, Y. *Synth. Commun.*, **1997**, 27, 3047.

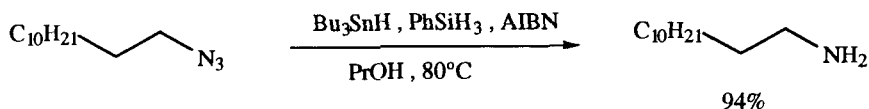


Upadhyay, T.T.; Katdare, S.P.; Sadbe, D.P.; Ramaswamy, V.; Sudalai, A. *Chem. Commun.*, **1997**, 1119.

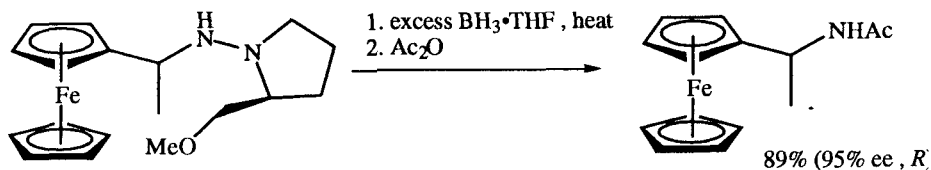


Brinkman, H.R. *Synth. Commun.*, **1996**, 26, 973.

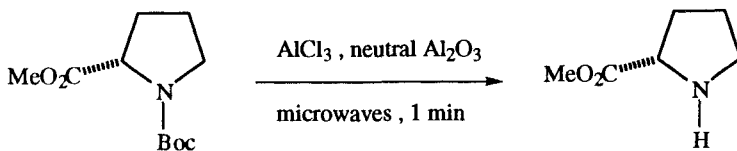
## SECTION 105A: PROTECTION OF AMINES



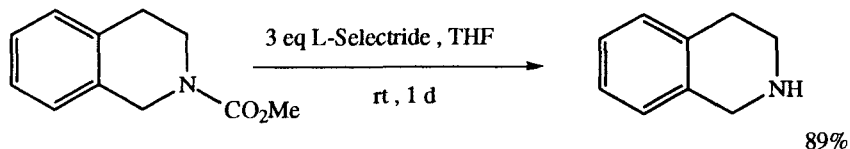
Hays, D.S.; Fu, G.C. *J. Org. Chem.*, **1998**, 63, 2796.



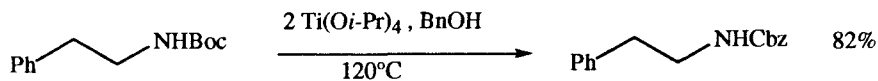
Enders, D.; Lochtman, R.; Meiers, M.; Müller, S.; Lazny, R. *SynLett*, **1998**, 1182.



Bose, D.S.; Lakshminarayana, V. *Tetrahedron Lett.*, **1998**, 39, 5631.



Coop, A.; Rice, K.C. *Tetrahedron Lett*, **1998**, 39, 8933.



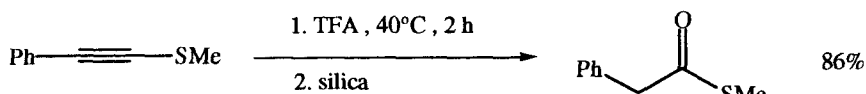
Shapiro, G.; Marzi, M. *J. Org. Chem.* **1997**, 62, 7096.



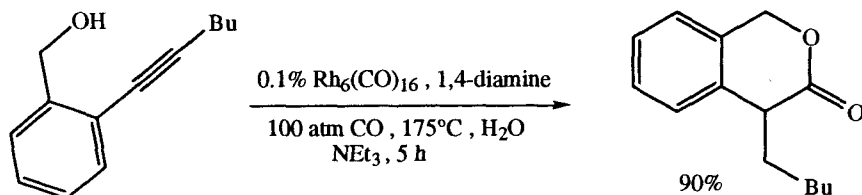
## CHAPTER 8

### PREPARATION OF ESTERS

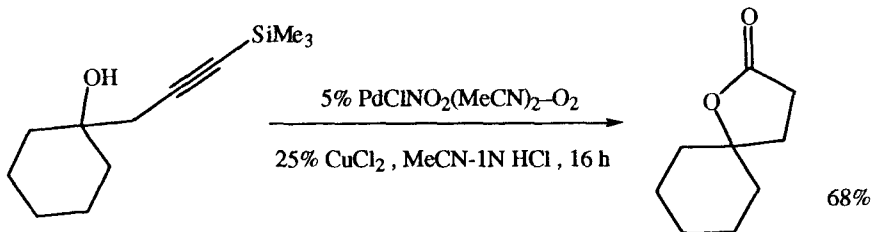
#### SECTION 106: ESTERS FROM ALKYNES



Braga, A.L.; Rodregues, O.E.D.; de Avila, E.; Silveira, C.C. *Tetrahedron Lett.*, **1998**, 39, 3395



Yoneda, E.; Kaneko, T.; Zhang, S.-W.; Takahashi, S. *Tetrahedron Lett.*, **1998**, 39, 5061.

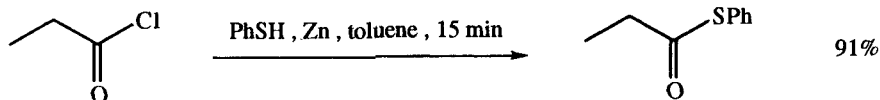


Compain, P.; Goré, J.; Vatlé, J.-M. *Tetrahedron*, **1996**, 52, 10405.

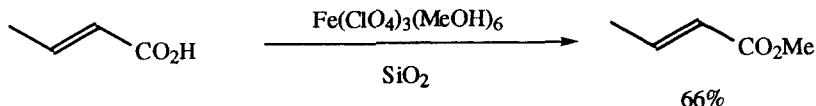
#### SECTION 107: ESTERS FROM ACID DERIVATIVES

The following types of reactions are found in this section:

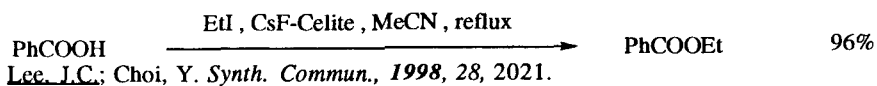
1. Esters from the reaction of alcohols with carboxylic acids, acid halides and anhydrides.
2. Lactones from hydroxy acids
3. Esters from carboxylic acids and halides, sulfoxides and miscellaneous compounds



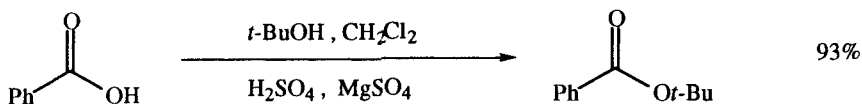
Meshram, H.M.; Reddy, G.S.; Bindu, K.H.; Yadav, J.S. *SynLett*, **1998**, 877.



Parmar, A.; Kaur, J.; Goyal, R.; Kumar, B.; Kumar, H. *Synth. Commun.*, **1998**, 28, 2821.

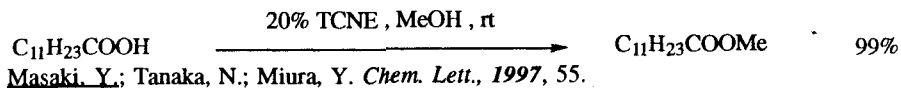


Lee, J.C.; Choi, Y. *Synth. Commun.*, **1998**, 28, 2021.

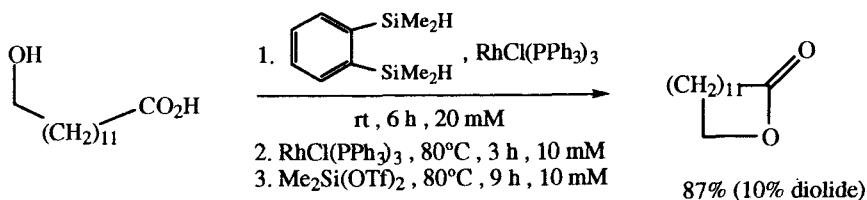


Can form ethers from alcohols

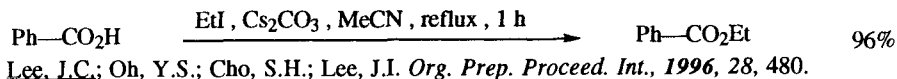
Wright, S.W.; Hageman, D.L.; Wright, A.S.; McClure, L.D. *Tetrahedron Lett.*, **1997**, 38, 734:



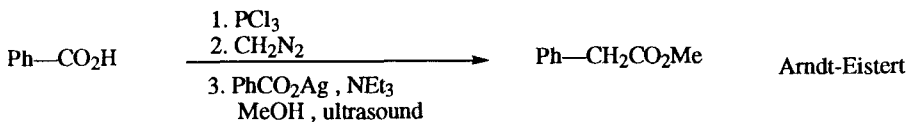
Masaki, Y.; Tanaka, N.; Miura, Y. *Chem. Lett.*, **1997**, 55.



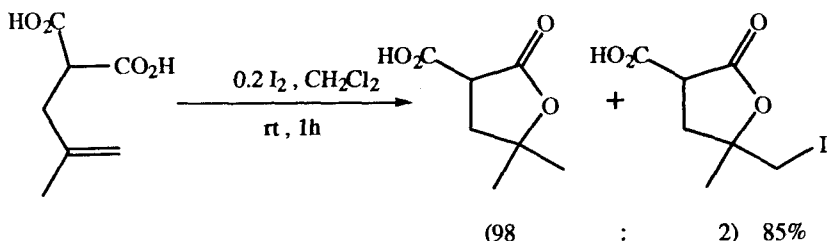
Mukaiyama, T.; Izumi, J.; Shiina, I. *Chem. Lett.*, **1997**, 187.



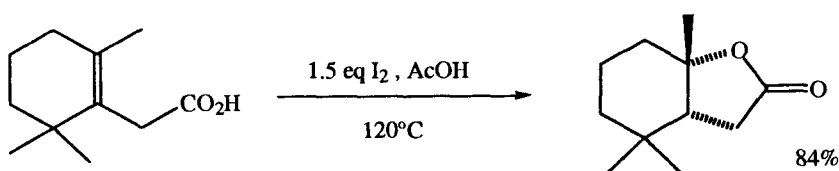
Lee, J.C.; Oh, Y.S.; Cho, S.H.; Lee, J.I. *Org. Prep. Proceed. Int.*, **1996**, 28, 480.



Winum, Y.-Y.; Kamal, M.; Leydet, A.; Rogue, J.-P.; Montero, J.-L. *Tetrahedron Lett.*, **1996**, 37, 1781.



Kim, K.M.; Ryu, E.K. *Tetrahedron Lett.*, **1996**, 37, 14411.

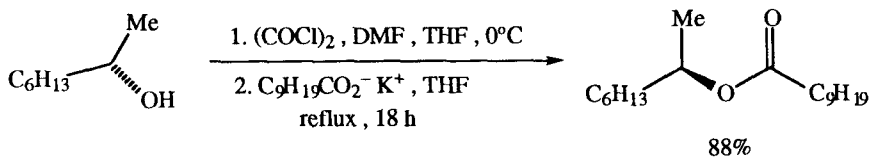


Yaguchi, Y.; Akiba, M.; Harada, M.; Kato, T. *Heterocycles*, **1996**, 43, 601.

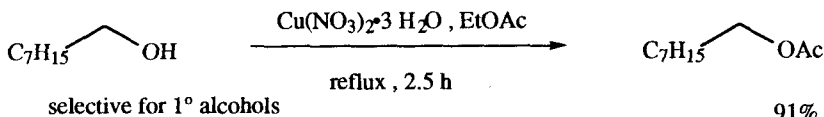
Further examples of the reaction  $\text{RCO}_2\text{H} + \text{R}'\text{OH} \rightarrow \text{RCO}_2\text{R}'$  are included in Section 108 (Esters from Alcohols and Phenols) and in Section 30A (Protection of Carboxylic Acids).

## SECTION 108: ESTERS FROM ALCOHOLS AND THIOLS

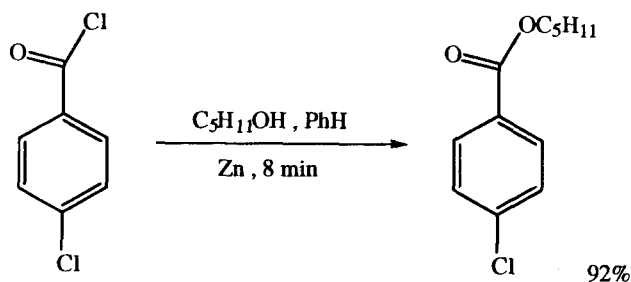
Further examples of the reaction  $\text{ROH} \rightarrow \text{RCO}_2\text{R}'$  are included in Section 107 (Esters from Acid Derivatives) and in Section 45A (Protection of Alcohols and Phenols).



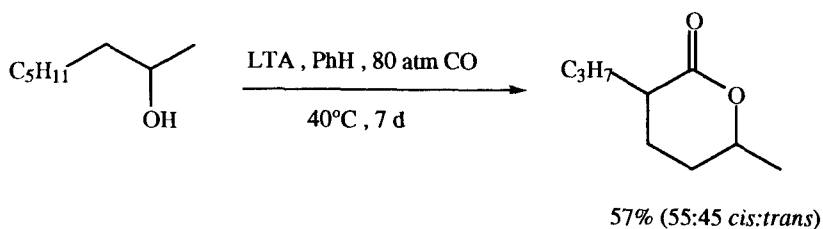
Barrett, A.G.M.; Braddock, D.C.; James, R.A.; Koike, N.; Procopiou, P.A.  
*J. Org. Chem.*, **1998**, 63, 6273.



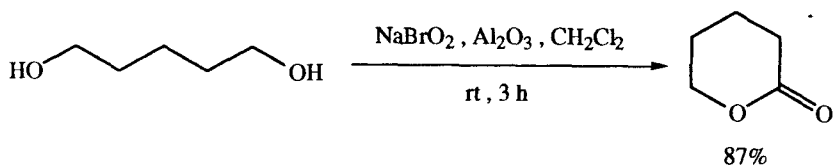
Iranpoor, N.; Firouzabadi, H.; Zolfigol, M.A. *Synth. Commun.*, **1998**, 28, 1923.



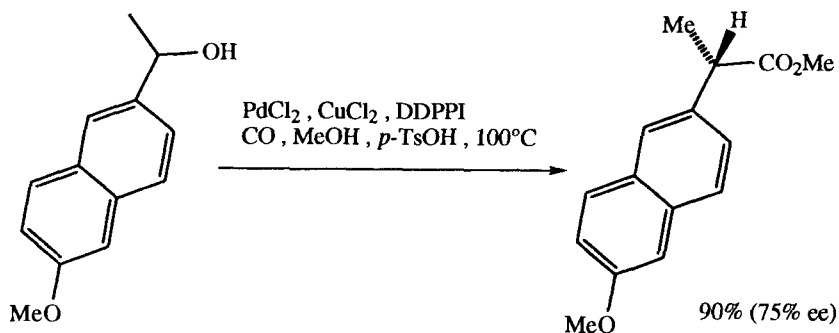
Yadav, J.S.; Reddy, G.S.; Srinivas, D.; Himabindu, K. *Synth. Commun.*, **1998**, 28, 2337.



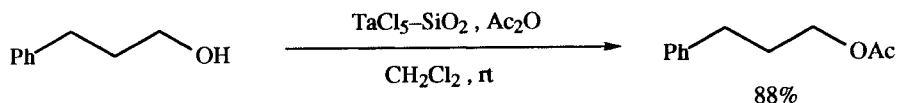
Tsunoi, S.; Ryu, J.; Okuda, T.; Tanaka, M.; Komatsu, M.; Sonoda, N. *J. Am. Chem. Soc.*, **1998**, 120, 8692.



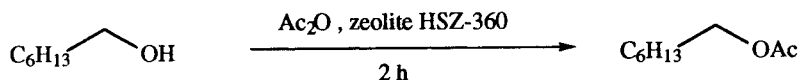
Hirano, M.; Yakabe, S.; Morimoto, T. *Synth. Commun.*, **1998**, 28, 127.



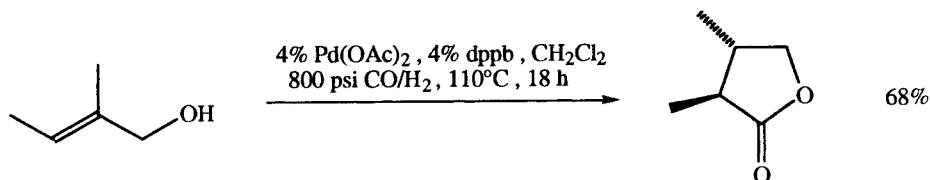
Xie, B.-H.; Xia, C.-G.; Lu, S.-J.; Chen, K.-J.; Kou, Y.; Yin, Y.-Q. *Tetrahedron Lett.*, **1998**, 39, 7365.



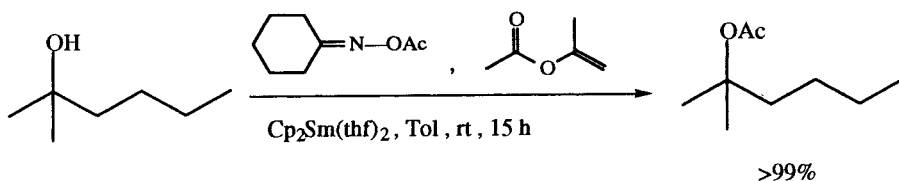
Chandrasekhar, S.; Ramachander, T.; Takhi, M. *Tetrahedron Lett.*, **1998**, 39, 3263.



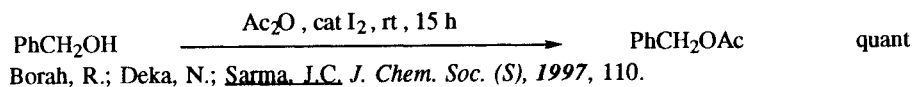
Ballini, R.; Bosica, G.; Carloni, S.; Ciaralli, L.; Maggi, R.; Sartori, G. *Tetrahedron Lett.*, **1998**, 39, 6049.



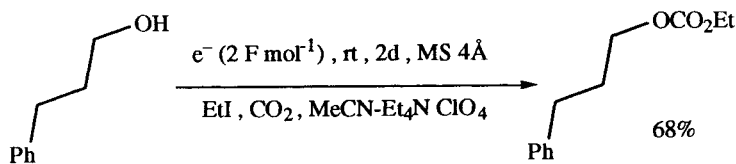
Brunner, M.; Alper, H. *J. Org. Chem.*, **1997**, 62, 7565.



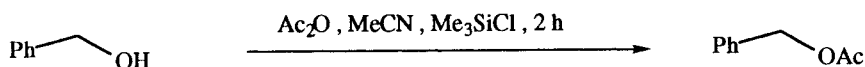
Tashiro, D.; Kawasaki, Y.; Sakaguchi, S.; Ishii, Y. *J. Org. Chem.*, **1997**, 62, 8141.



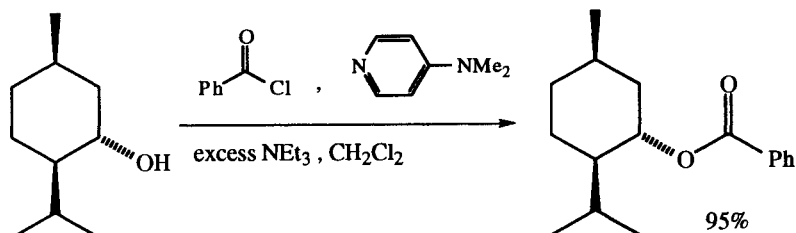
Borah, R.; Deka, N.; Sarma, J.C. *J. Chem. Soc. (S)*, **1997**, 110.



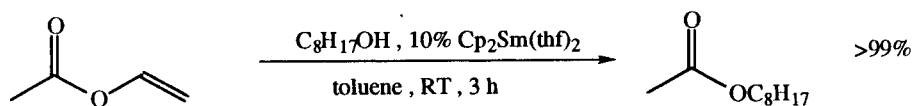
Casadei, M.A.; Inesi, A.; Rossi, L. *Tetrahedron Lett.*, **1997**, 38, 3565.



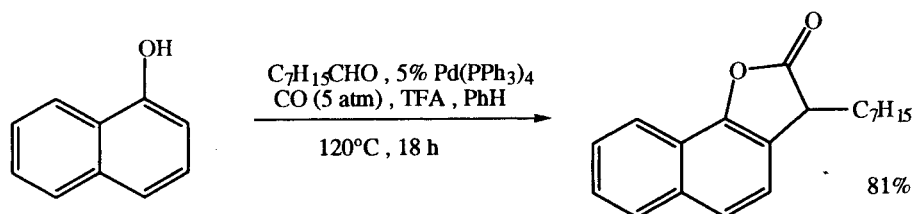
Kumareswaran, R.; Gupta, A.; Vankar, Y.D. *Synth. Commun.*, **1997**, 27, 277.



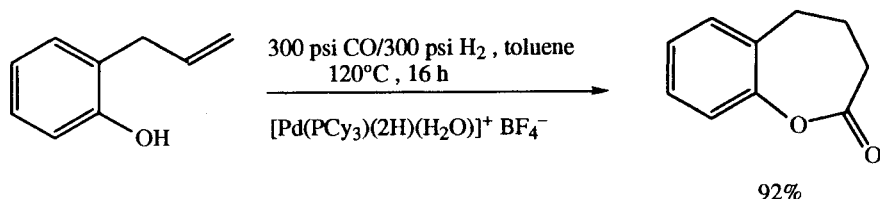
Wolfe, M.S. *Synth. Commun.*, **1997**, 27, 2975.



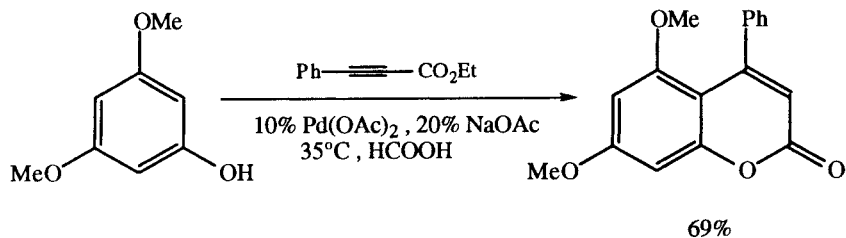
Ishii, Y.; Takeno, M.; Kawasaki, Y.; Muromachi, A.; Nishiyama, Y.; Sakaguchi, S. *J. Org. Chem.*, **1996**, 61, 3088.



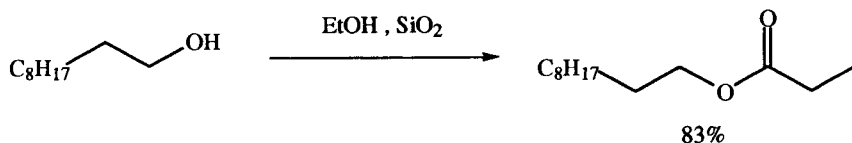
Sato, T.; Tsuda, T.; Kushino, Y.; Miura, M.; Nomura, M. *J. Org. Chem.*, **1996**, 61, 6476.



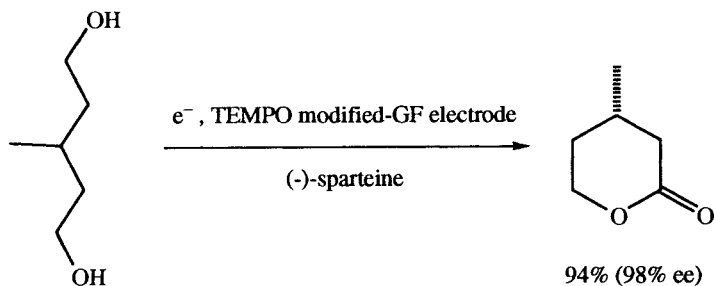
El Ali, B.; Okuro, K.; Vasapollo, G.; Alper, H. *J. Am. Chem. Soc.*, **1996**, 118, 4264.



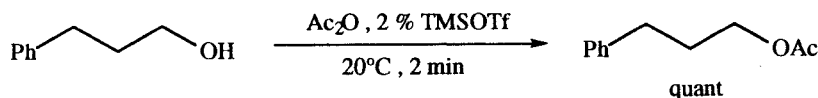
Trost, B.M.; Toste, F.D. *J. Am. Chem. Soc.*, **1996**, 118, 6305.



Nascimento, M. de G.; Zanutto, S.P.; Scremin, M.; Rezende, M.C.  
*Synth. Commun.*, **1996**, 26, 2715.

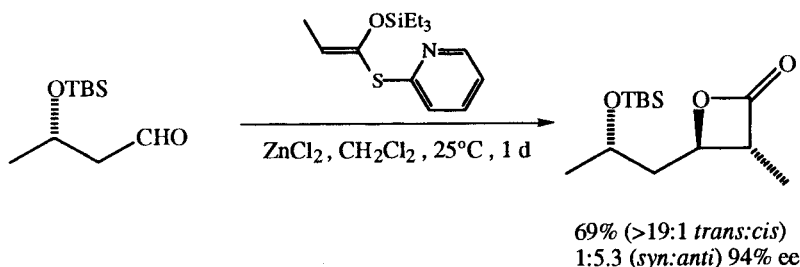


Yanagisawa, Y.; Kashiwagi, Y.; Kurashima, F.; Anazai, J.; Osa, T.; Bobbitt, J.M.  
*Chem. Lett.*, **1996**, 1043.

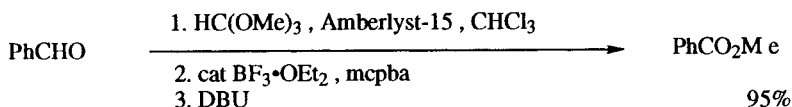


Procopiu, P.A.; Baugh, S.P.D.; Flack, S.S.; Inglis, G.G.A. *Chem. Commun.*, **1996**, 2625

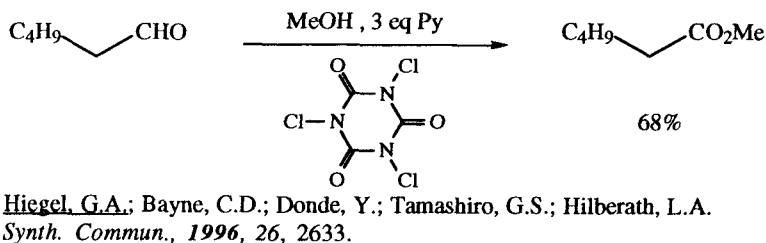
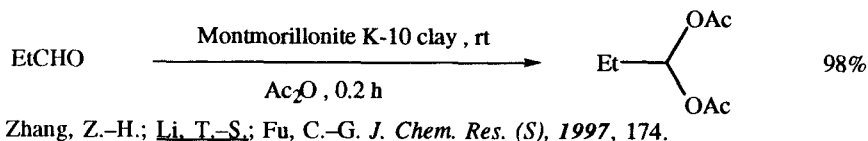
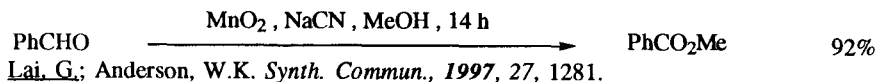
## SECTION 109: ESTERS FROM ALDEHYDES



Yang, H.W.; Romo, D. *J. Org. Chem.*, **1998**, 63, 1344.



Rhee, H.; Kim, J.Y. *Tetrahedron Lett.*, **1998**, 39, 1365.



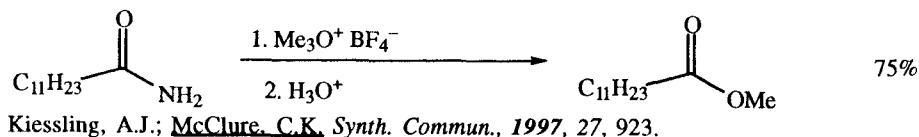
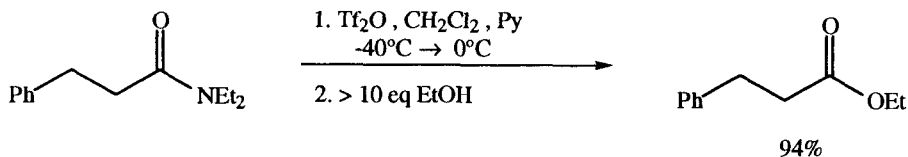
Related Methods: Section 117 (Esters from Ketones)

## SECTION 110: ESTERS FROM ALKYL, METHYLENES AND ARYL

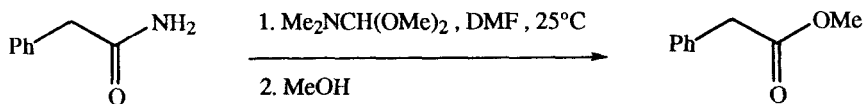
No examples of the reaction  $\text{R-R} \rightarrow \text{RCO}_2\text{R}'$  or  $\text{R}'\text{CO}_2\text{R}$  ( $\text{R}, \text{R}' = \text{alkyl, aryl, etc.}$ ) occur in the literature. For the reaction  $\text{R-H} \rightarrow \text{RCO}_2\text{R}'$  or  $\text{R}'\text{CO}_2\text{R}$ , see Section 116 (Esters from Hydrides).

NO ADDITIONAL EXAMPLES

## SECTION 111: ESTERS FROM AMIDES

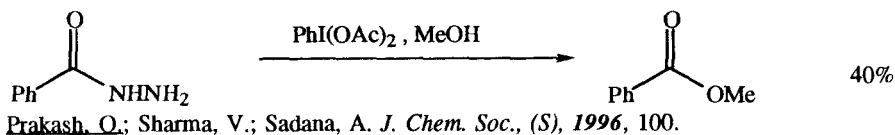






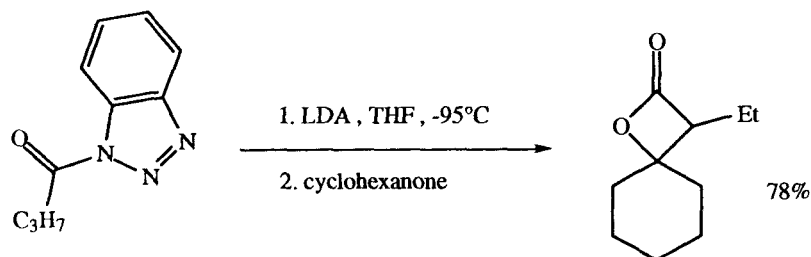
94%

Anelli, P.L.; Brocchetta, M.; Palano, D.; Visigalli, M. *Tetrahedron Lett.*, **1997**, 38, 2367.



40%

Prakash, Q.; Sharma, V.; Sadana, A. *J. Chem. Soc., (S)*, **1996**, 100.



78%

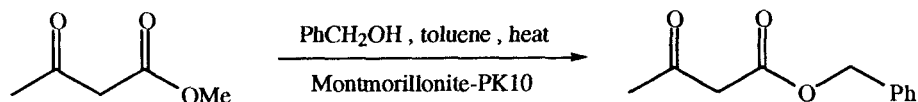
Wedler, C.; Kleiner, K.; Kunath, A.; Schick, H. *Liebigs Ann. Chem.*, **1996**, 881.

## SECTION 112: ESTERS FROM AMINES

NO ADDITIONAL EXAMPLES

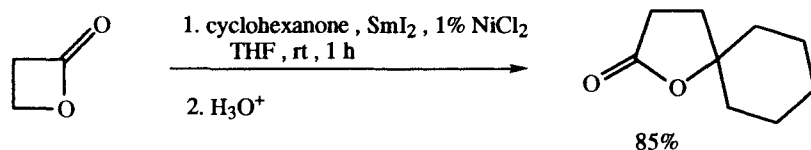
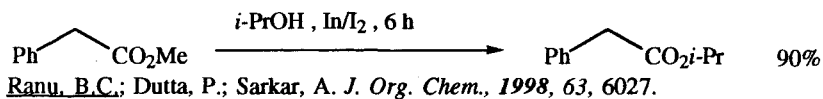
## SECTION 113: ESTERS FROM ESTERS

Conjugate reductions and conjugate alkylations of unsaturated esters are found in Section 74 (Alkyls from Alkenes).

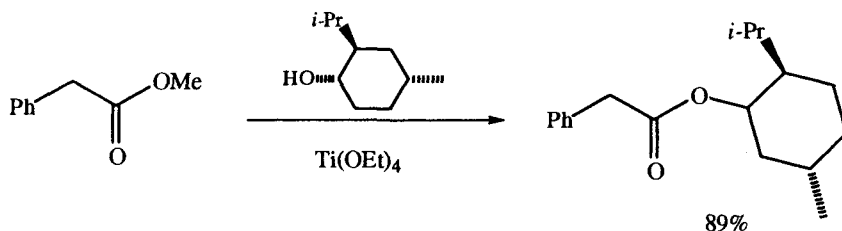


86%

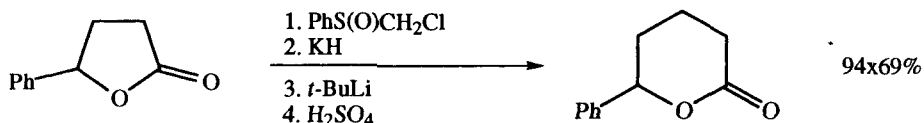
Ponde, D.E.; Deshpande, V.H.; Bulbule, V.J.; Sudalai, A.; Gajare, A.S. *J. Org. Chem.*, **1998**, 63, 1058.



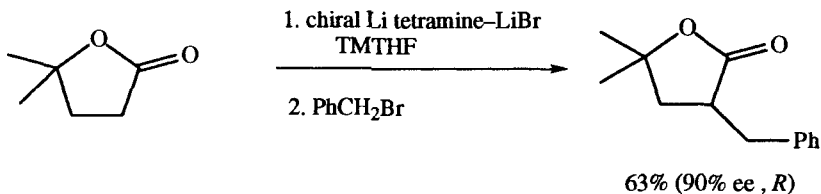
Machrouhi, F.; Namy, J.-L. *Tetrahedron*, **1998**, *54*, 11111.



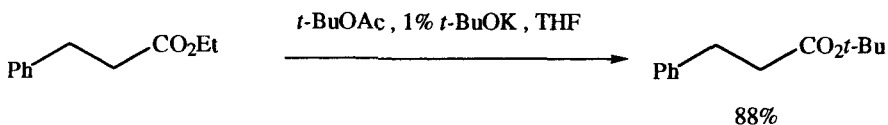
Krasik, P. *Tetrahedron Lett.*, **1998**, *39*, 4223.



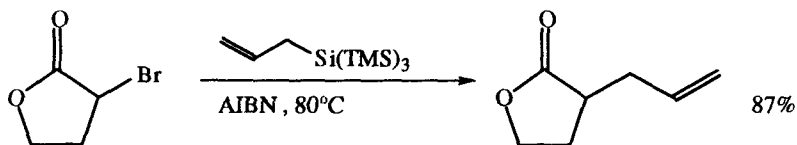
Sato, T.; Kurihira, T. *Tetrahedron Lett.*, **1998**, *39*, 9215.



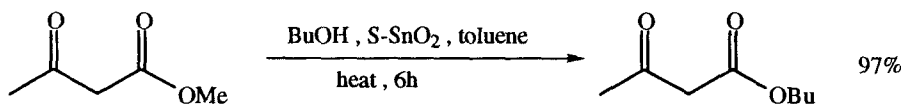
Matsuo, J.-i.; Kobayashi, S.; Koga, K. *Tetrahedron Lett.*, **1998**, *39*, 9723.



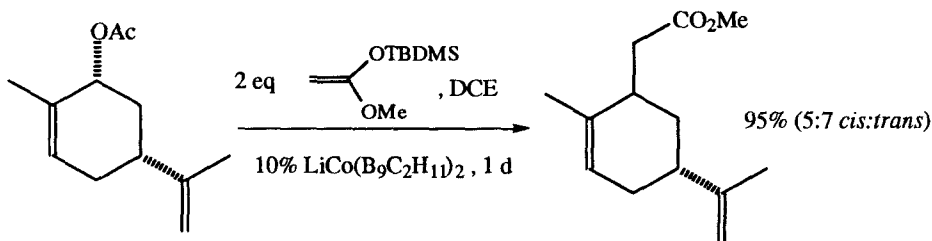
Stanton, M.G.; Gagné, M.R. *J. Org. Chem.*, **1997**, *62*, 8240.



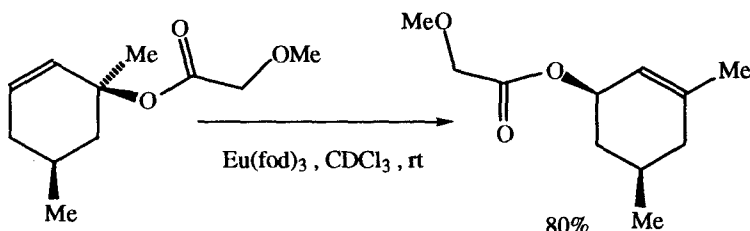
Chatgililoglu, C.; Ferreri, C.; Ballestri, M.; Curran, D.P. *Tetrahedron Lett.*, **1996**, 37, 6387.  
Chatgililoglu, C.; Alberti, A.; Ballestri, M.; MacCiatelli, D.; Curran, D.P. *Tetrahedron Lett.*, **1996**, 37, 6391.



Chavan, S.P.; Zubaidha, P.K.; Dantale, S.W.; Keshavaraja, A.; Ramaswamy, A.V.; Ravindranathan, T. *Tetrahedron Lett.*, **1996**, 37, 233.

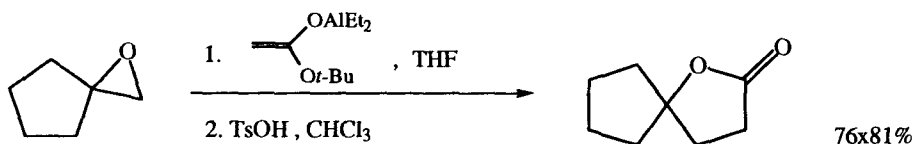


Grieco, P.A.; DuBay, W.J.; Todd, L.J. *Tetrahedron Lett.*, **1996**, 37, 8707.

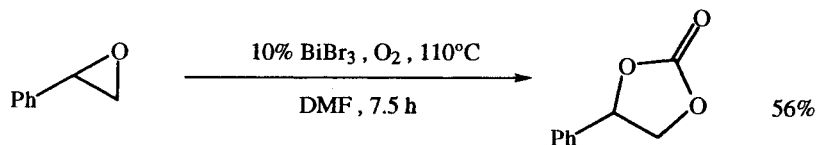


Shull, B.K.; Sakai, T.; Koreeda, M. *J. Am. Chem. Soc.*, **1996**, 118, 11690.

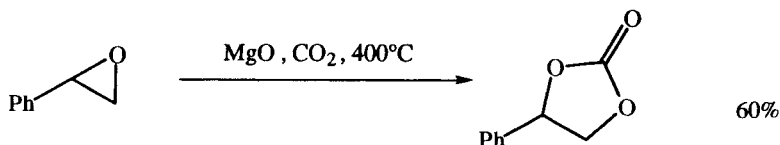
## SECTION 114: ESTERS FROM ETHERS, EPOXIDES AND THIOETHERS



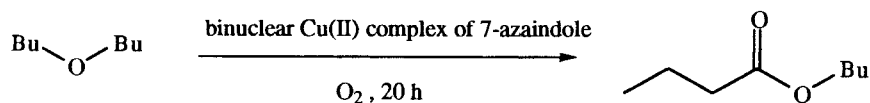
Taylor, S.K.; Chmiel, N.H.; Mann, E.E.; Silver, M.E.; Vyvyan, J.R. *Synthesis*, **1998**, 1009.



LeBoisselier, V.; Postel, M.; Dufiach, E. *Chem. Commun.*, **1997**, 95.

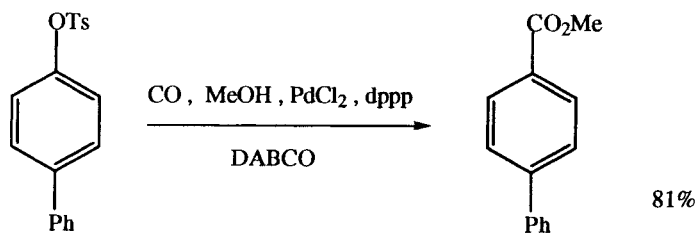


Yano, T.; Matsui, H.; Koike, T.; Ishiguro, H.; Fujihara, H.; Yoshihara, M.; Maeshima, T. *Chem. Commun.*, **1997**, 1129.

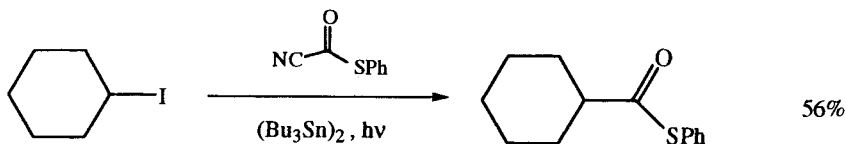


Minakata, S.; Imai, E.; Ohshima, Y.; Inaki, K.; Ryu, I.; Komatsu, M.; Ohshiro, Y. *Chem. Lett.*, **1996**, 19.

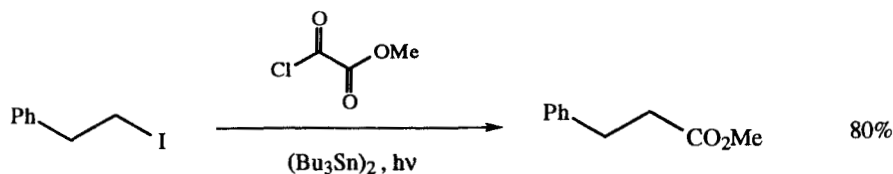
## SECTION 115: ESTERS FROM HALIDES AND SULFONATES



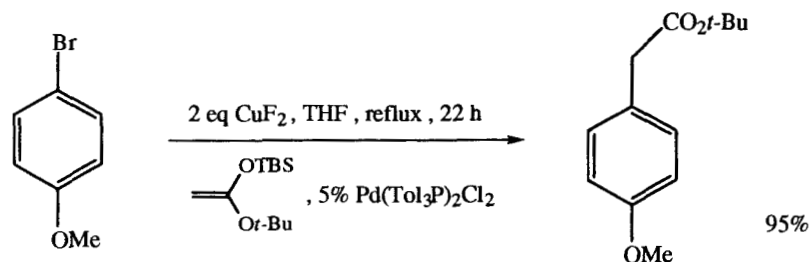
Kubota, Y.; Nakada, S.; Sugi, Y. *SynLett*, **1998**, 183.



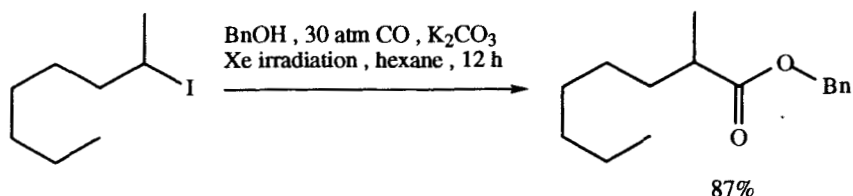
Kim, S.; Jon, S.Y. *Chem. Commun.*, **1998**, 815.



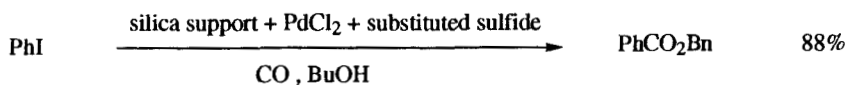
Kim, S.; Jon, S.Y. *Tetrahedron Lett.*, **1998**, 39, 7317.



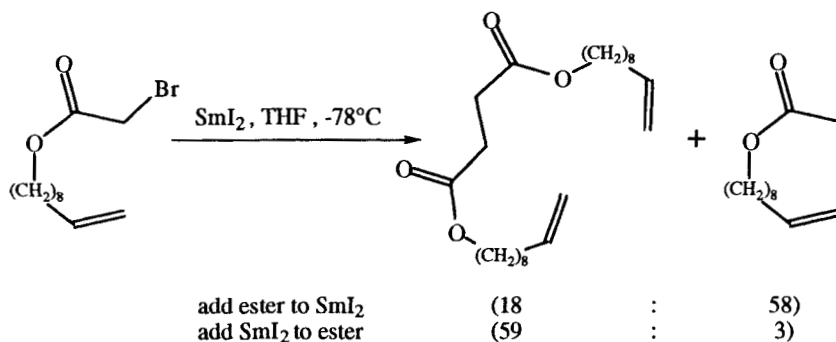
Agnelli, F.; Sulikowski, G.A. *Tetrahedron Lett.*, **1998**, 39, 8807.



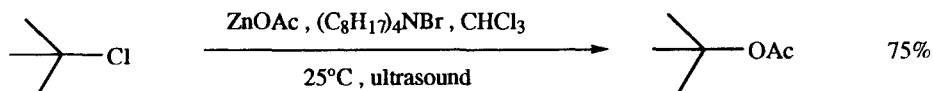
Nagahara, K.; Ryu, L.; Komatsu, M.; Sonoda, N. *J. Am. Chem. Soc.*, **1997**, 118, 5465.



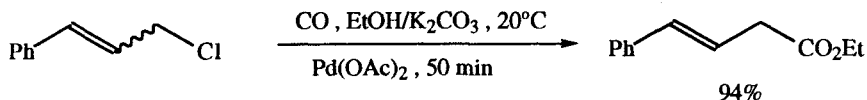
Cai, M.-Z.; Song, C.-S.; Huang, X. *J. Chem. Soc., Perkin Trans. 1*, **1997**, 2273.



Balau, É; Ruel, R. *Tetrahedron Lett.*, **1996**, 37, 801.



Jayasree, J.; Rao, J.M. *Synth. Commun.*, **1996**, 26, 1103.

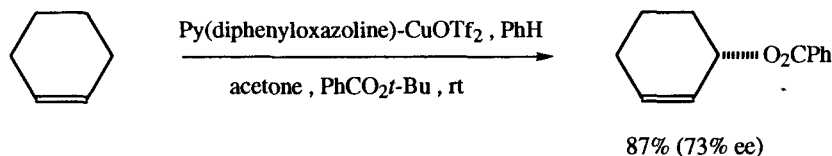


Kiji, L.; Okano, T.; Higashimae, Y.; Fukui, Y. *Bull. Chem. Soc. Jpn.*, **1996**, 69, 1029.

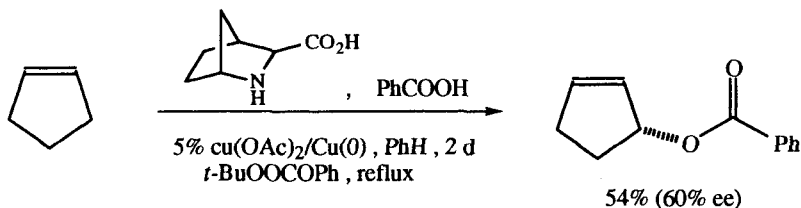
Related Methods: Section 25 (Acid Derivatives from Halides).

## SECTION 116: ESTERS FROM HYDRIDES

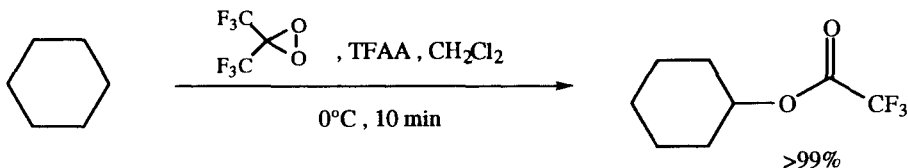
This section contains examples of the reaction  $\text{R-H} \rightarrow \text{RCO}_2\text{R}'$  or  $\text{R}'\text{CO}_2\text{R}$  (R = alkyl, aryl, etc.).



Sekar, G.; Datta Gupta, A.; Singh, V.K. *J. Org. Chem.*, **1998**, 63, 2961.



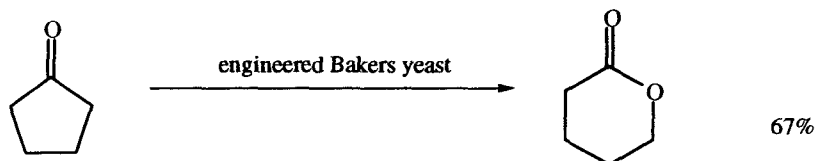
Södergren, M.J.; Andersson, P.G. *Tetrahedron Lett.*, **1996**, 37, 7577.



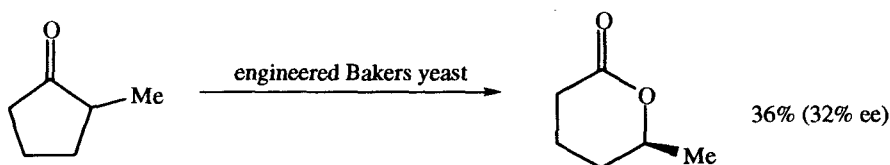
Asensio, G.; Mello, R.; González-Nuñez, M.E.; Castellano, G.; Corral, J. *Angew. Chem. Int. Ed.*, **1996**, 35, 217.

Also via: Section 26 (Acid Derivatives) and Section 41 (Alcohols).

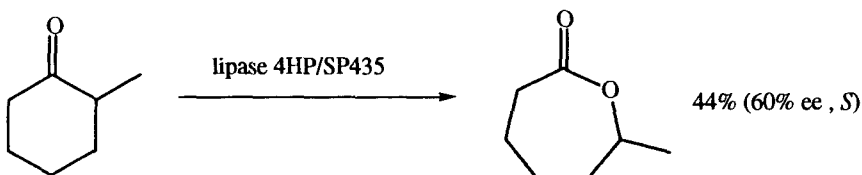
## SECTION 117: ESTERS FROM KETONES



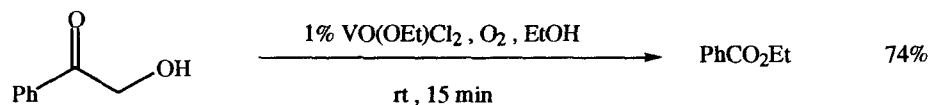
Stewart, J.D.; Reed, K.W.; Martinez, C.A.; Zhu, J.; Chen, G.; Kayser, M.M. *J. Am. Chem. Soc.*, **1998**, *120*, 3541.



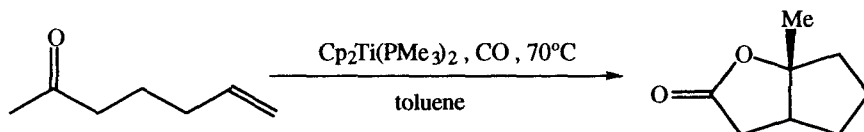
Yayser, M.M.; Chen, G.; Stewart, J.D. *J. Org. Chem.*, **1998**, *63*, 7103.



Pchelka, B.K.; Gelo-Pujic, M.; Guibé-Jampel, E. *J. Chem. Soc., Perkin Trans. 1*, **1998**, 2625

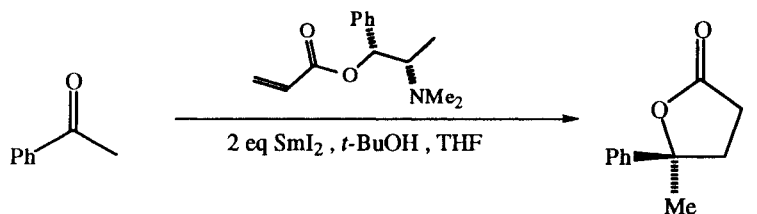


Dang, H.-S.; Roberts, B.P. *J. Chem. Soc., Perkin Trans. 1*, **1998**, 67.

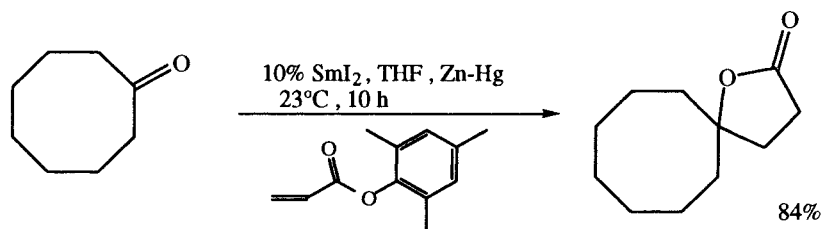


Kablaoui, N.M.; Hicks, F.A.; Buchwald, S.L. *J. Am. Chem. Soc.*, **1997**, *119*, 4424.

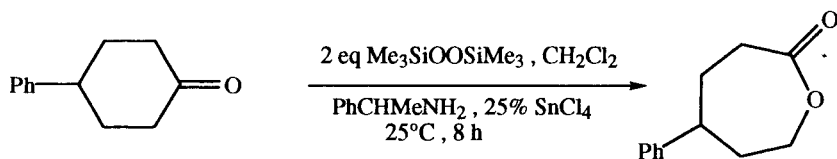
Kablaoui, N.M.; Hicks, F.A.; Buchwald, S.L. *J. Am. Chem. Soc.*, **1996**, *118*, 5818.



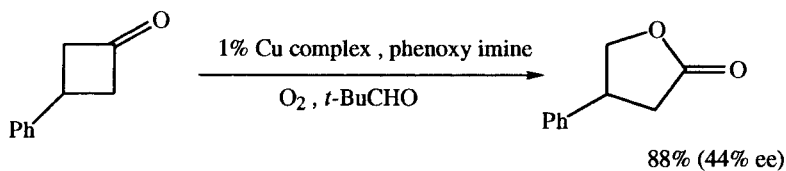
86% (90% ee)

Fukuzawa, S.; Seki, K.; Tatsuzawa, M.; Mutoh, K. *J. Am. Chem. Soc.*, **1997**, *119*, 1482.

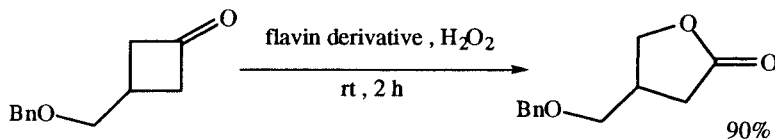
84%

Corey, E.J.; Zheng, G.Z. *Tetrahedron Lett.*, **1997**, *38*, 2045.

82%

Göttlich, R.; Yamakoshi, K.; Sasai, H.; Shibasaki, M. *SynLett*, **1997**, 971.

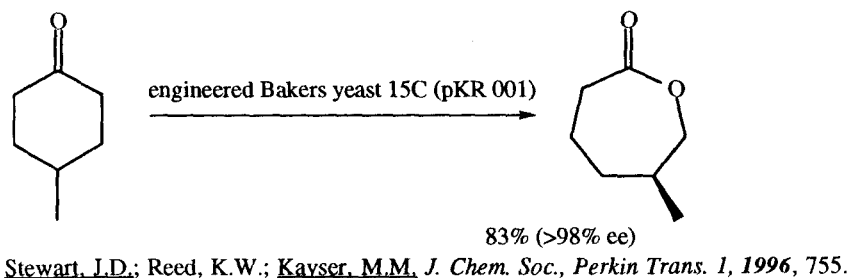
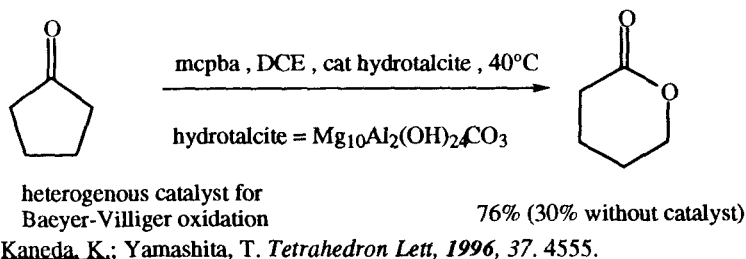
88% (44% ee)

Bolm, C.; Luong, T.K.K.; Schlingloff, G. *SynLett*, **1997**, 1151.

90%

Mazzini, C.; Lebreton, J.; Furstoss, R. *Heterocycles*, **1997**, *45*, 1161.



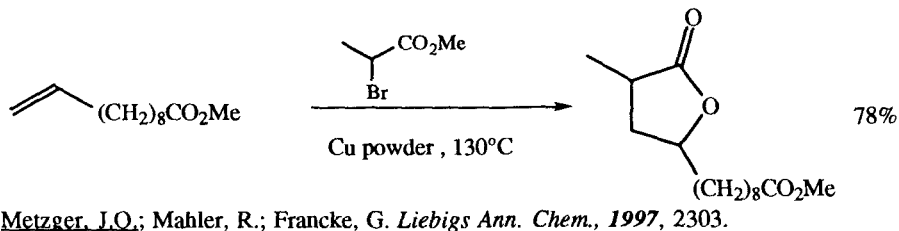
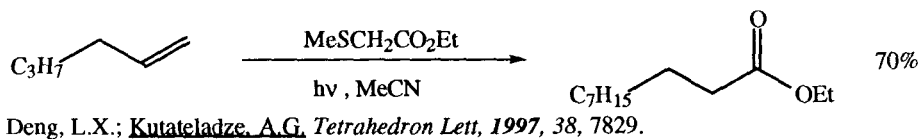


Also via: Section 27 (Acid Derivatives).

## SECTION 118: ESTERS FROM NITRILES

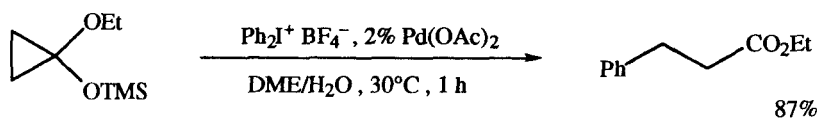
NO ADDITIONAL EXAMPLES

## SECTION 119: ESTERS FROM ALKENES



Also via: Section 44 (Alcohols).

**SECTION 120: ESTERS FROM MISCELLANEOUS COMPOUNDS**

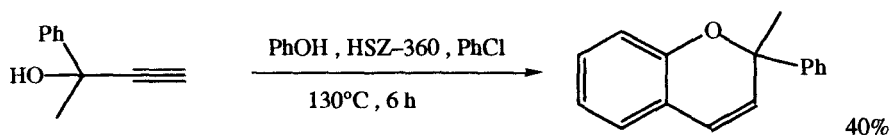


Kang, S.-K.; Yamaguchi, T.; Ho, P.S.; Kim, W.-Y.; Yoon, S.-K.  
*Tetrahedron Lett.*, **1997**, 38, 1947.

## CHAPTER 9

# PREPARATION OF ETHERS, EPOXIDES AND THIOETHERS

### SECTION 121: ETHERS, EPOXIDES AND THIOETHERS FROM ALKYNES



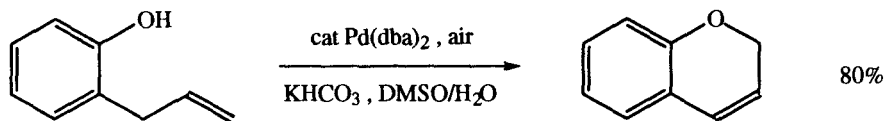
HSZ = a zeolite

Bigi, F.; Carloni, S.; Maggi, R.; Muchetti, C.; Sartori, G. *J. Org. Chem.*, **1997**, 62, 7024.

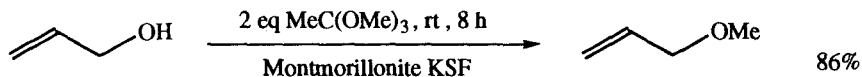
### SECTION 122: ETHERS, EPOXIDES AND THIOETHERS FROM ACID DERIVATIVES

NO ADDITIONAL EXAMPLES

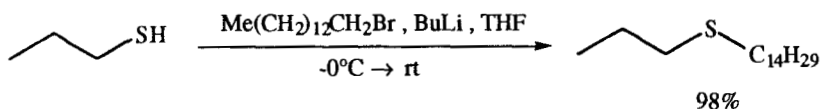
### SECTION 123: ETHERS, EPOXIDES AND THIOETHERS FROM ALCOHOLS AND THIOLS



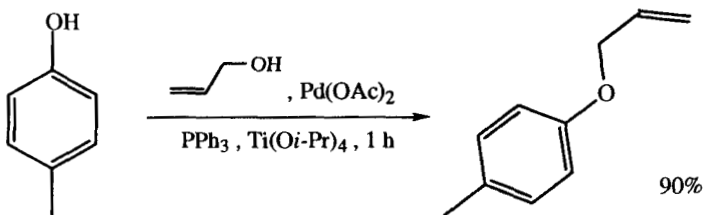
Larock, R.C.; Wei, L.; Hightower, T.R. *SynLett*, **1998**, 522.



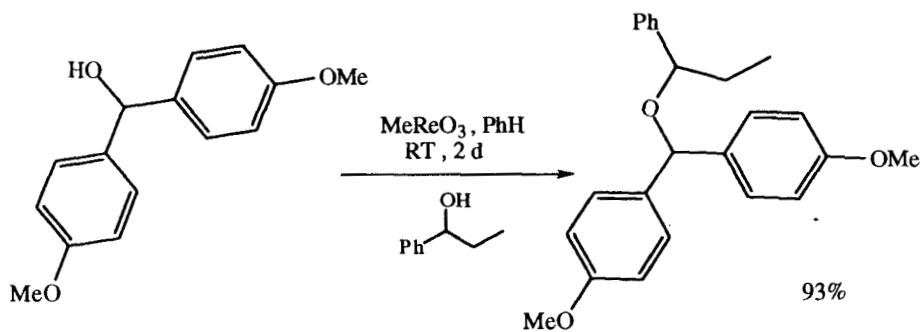
Kumar, H.M.S.; Reddy, B.V.S.; Mohanty, P.K.; Yadav, J.S. *Tetrahedron Lett.*, **1997**, 38, 3619



Yin, J.; Pidgeon, C. *Tetrahedron Lett.*, **1997**, 38, 5953.



Satoh, T.; Ikeda, M.; Miura, M.; Nomura, M. *J. Org. Chem.*, **1997**, 62, 4877.

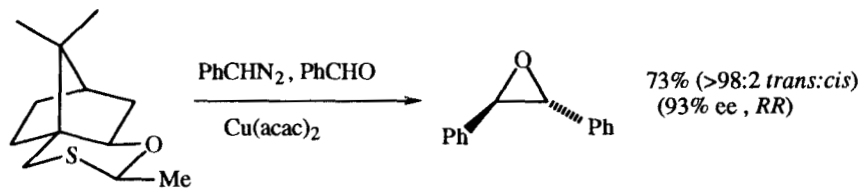


Zhu, Z.; Espenson, J.H. *J. Org. Chem.*, **1996**, 61, 324.

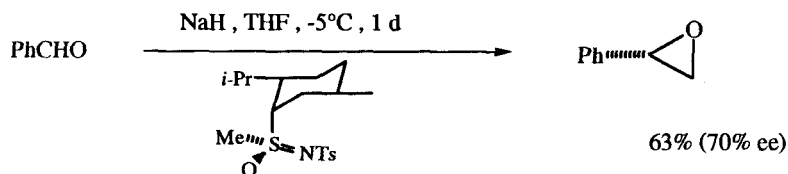


Lin, J.-M.; Li, H.-H.; Zhou, A.-M. *Tetrahedron Lett.*, **1996**, 37, 5159.

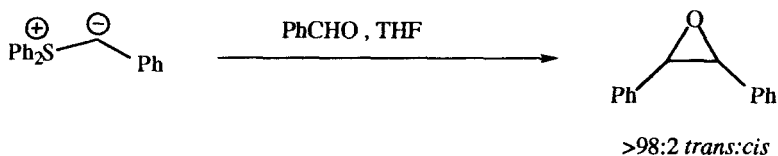
## SECTION 124: ETHERS, EPOXIDES AND THIOETHERS FROM ALDEHYDES



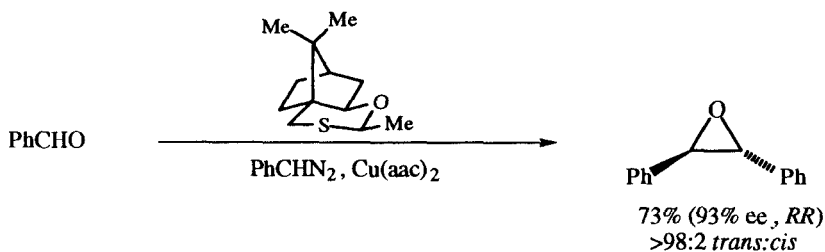
Aggarwal, V.K. *SynLett.*, **1998**, 329.



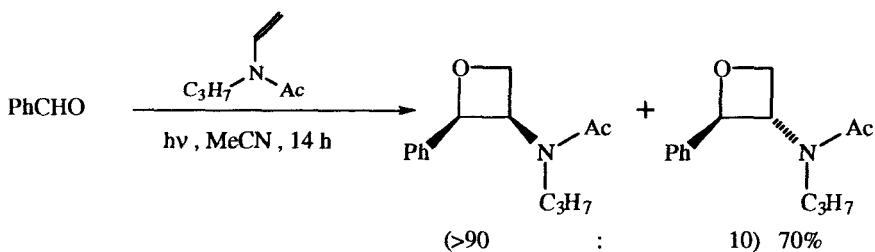
Baird, C.P.; Taylor, P.C. *J. Chem. Soc., Perkin Trans. 1*, **1998**, 3399.



Aggarwal, V.K.; Calamai, S.; Ford, J.G. *J. Chem. Soc., Perkin Trans. 1*, **1997**, 593.



Aggarwal, V.K.; Ford, J.G.; Thompson, A.; Jones, R.V.H.; Standen, M.C.H. *J. Am. Chem. Soc.*, **1996**, 118, 7004.



Bach, T. *Angew. Chem. Int. Ed.*, **1996**, 35, 884.

## SECTION 125: ETHERS, EPOXIDES AND THIOETHERS FROM ALKYLs, METHYLENES AND ARYLs

NO ADDITIONAL EXAMPLES

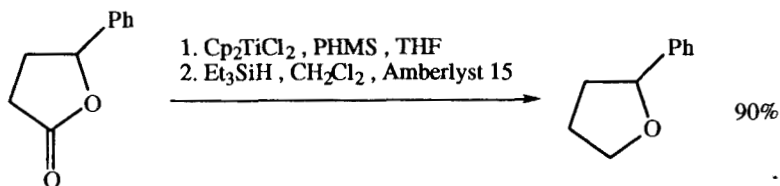
**SECTION 126: ETHERS, EPOXIDES AND THIOETHERS FROM AMIDES**

NO ADDITIONAL EXAMPLES

**SECTION 127: ETHERS, EPOXIDES AND THIOETHERS FROM AMINES**

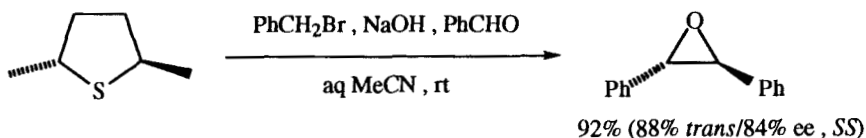
NO ADDITIONAL EXAMPLES

**SECTION 128: ETHERS, EPOXIDES AND THIOETHERS FROM ESTERS**

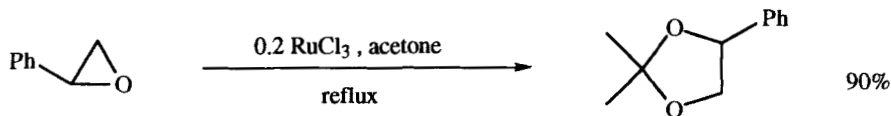


Hansen, M.C.; Verdaguer, X.; Buchwald, S.L., *J. Org. Chem.*, **1998**, 63, 2360.

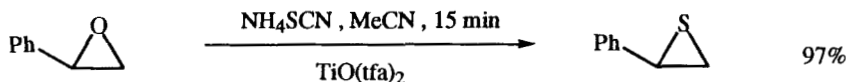
**SECTION 129: ETHERS, EPOXIDES AND THIOETHERS FROM ETHERS, EPOXIDES AND THIOETHERS**



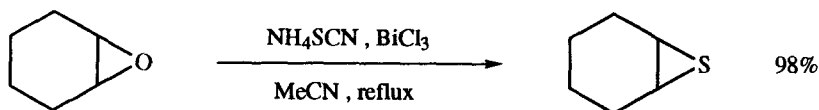
Julienne, K.; Metzner, P. *J. Org. Chem.*, **1998**, 63, 4532.



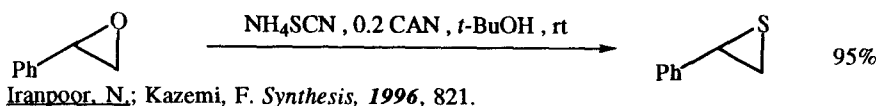
Iranpoor, N.; Kazemi, F. *Synth. Commun.*, **1998**, 28, 3189.



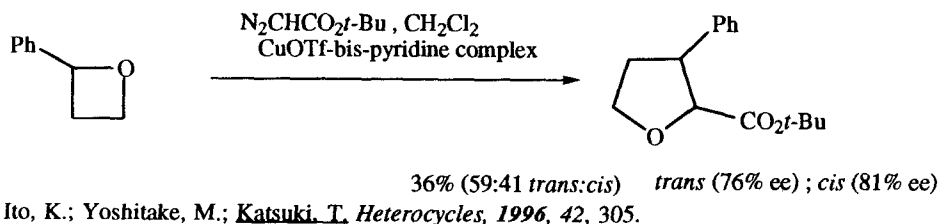
Iranpoor, N.; Zeynizadeh, B. *Synth. Commun.*, **1998**, 28, 3913.



Mohammadpoor-Baltork, I.; Aliyan, H. *Synth. Commun.*, **1998**, 28, 3943.



Iranpoor, N.; Kazemi, F. *Synthesis*, **1996**, 821.

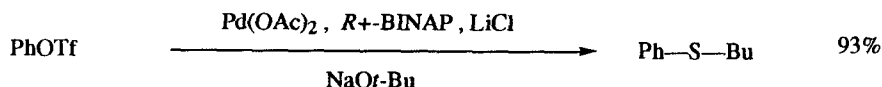


Ito, K.; Yoshitake, M.; Katsuki, T. *Heterocycles*, **1996**, 42, 305.

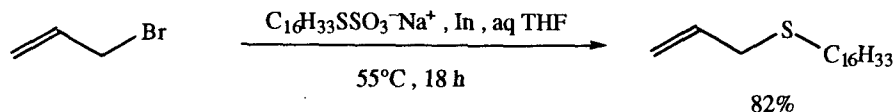
## SECTION 130: ETHERS, EPOXIDES AND THIOETHERS FROM HALIDES AND SULFONATES



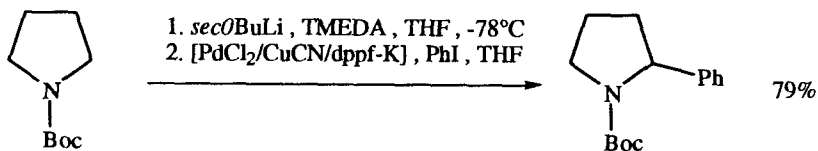
Yanada, K.; Fujita, T.; Yanada, R. *SynLett*, **1998**, 971.



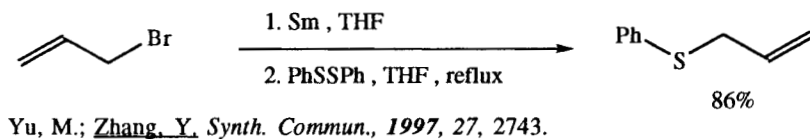
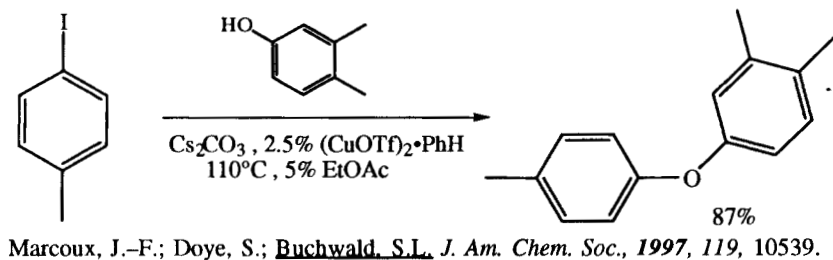
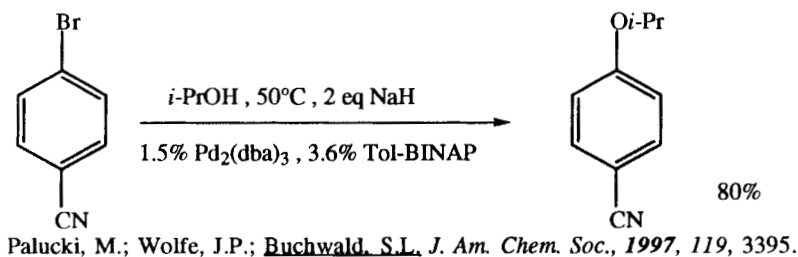
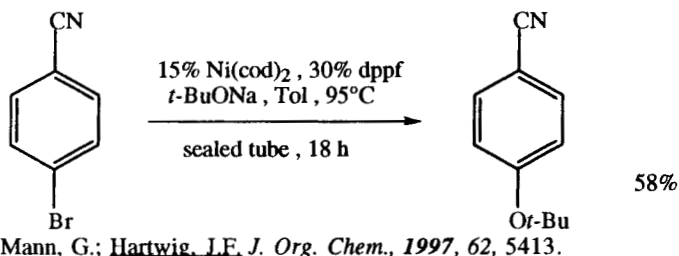
Zheng, N.; McWilliams, J.C.; Fleitz, F.J.; Armstrong III, J.D.; Volante, R.P. *J. Org. Chem.*, **1998**, 63, 9606.



Zhan, Z.; Zhang, Y. *Synth. Commun.*, **1998**, 28, 493.



Larhed, M.; Hallberg, A. *J. Org. Chem.*, **1997**, 62, 7858.



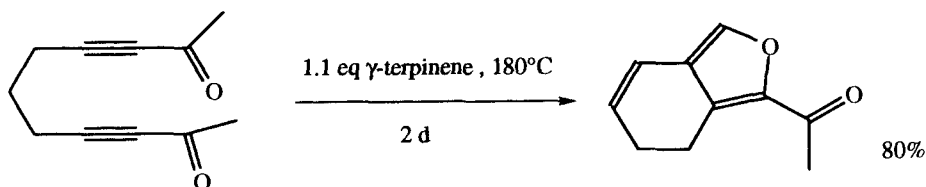
Related Methods: Section 123 (Ethers from Alcohols).

## SECTION 131: ETHERS, EPOXIDES AND THIOETHERS FROM HYDRIDES

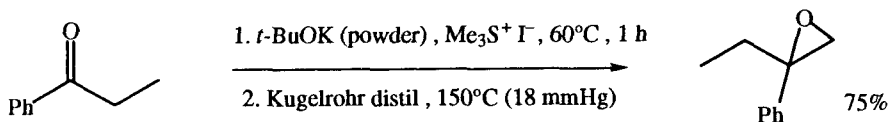
NO ADDITIONAL EXAMPLES



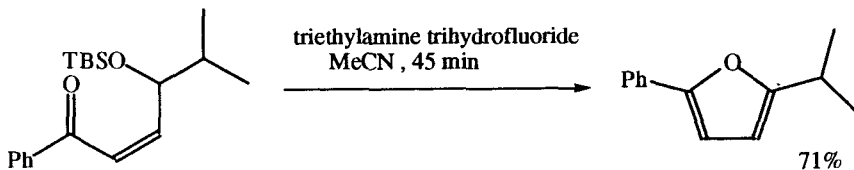
### SECTION 132: ETHERS, EPOXIDES AND THIOETHERS FROM KETONES



Wills, M.S.B.; Danheiser, R.L. *J. Am. Chem. Soc.*, **1998**, *120*, 9378.



solvent free  
Toda, F.; Kanemoto, K. *Heterocycles*, **1997**, *46*, 185.



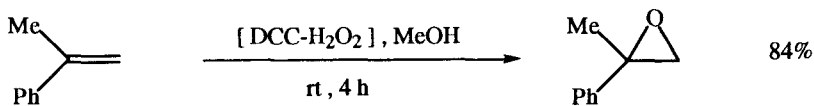
Sammond, D.M.; Sammakia, T. *Tetrahedron Lett.*, **1996**, *37*, 6065.

Related Methods: Section 124 (Epoxides from Aldehydes).

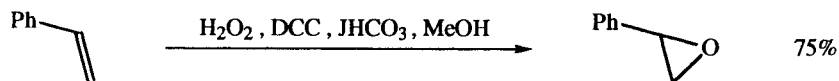
### SECTION 133: ETHERS, EPOXIDES AND THIOETHERS FROM NITRILES

NO ADDITIONAL EXAMPLES

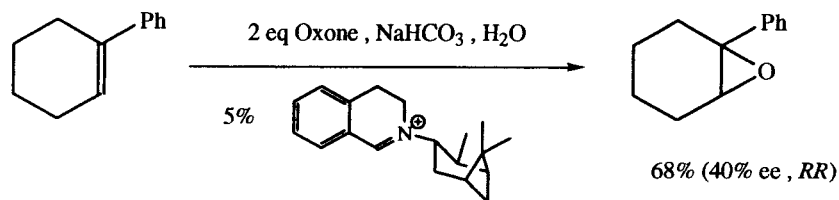
### SECTION 134: ETHERS, EPOXIDES AND THIOETHERS FROM ALKENES



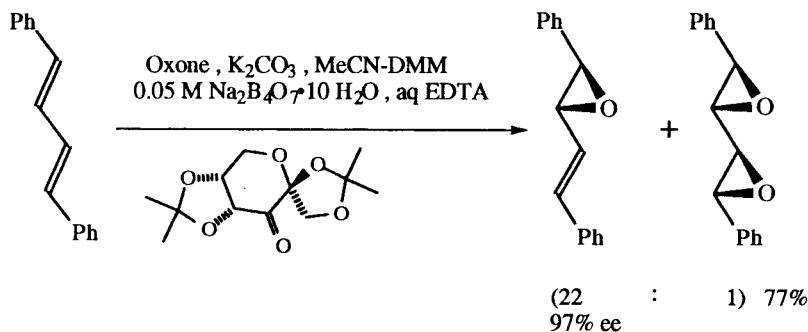
Murray, R.W.; Iyanar, K. *J. Org. Chem.*, **1998**, *63*, 1730.



Majetich, G.; Hicks, R.; Sun, G.-R.; McGill, P. *J. Org. Chem.*, **1998**, 63, 2564.

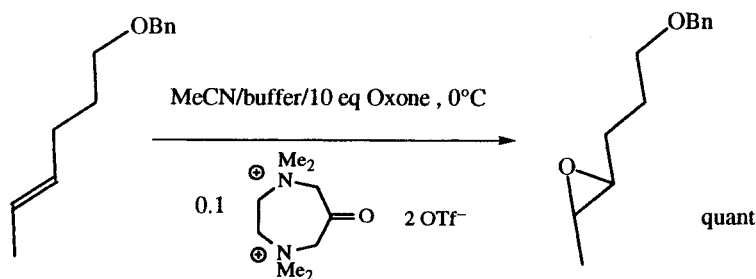


Page, P.C.B.; Rassias, G.A.; Bethell, D.; Schilling, M.B. *J. Org. Chem.*, **1998**, 63, 2774.

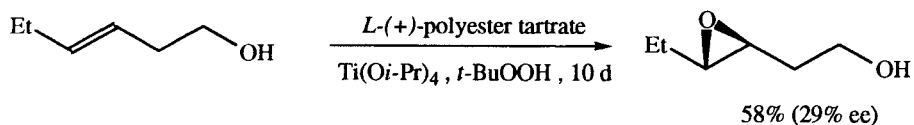


94% conversion

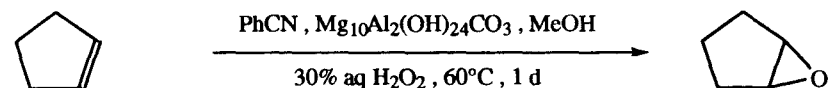
Frohn, M.; Dalkiewicz, M.; Tu, Y.; Wang, Z.-X.; Shi, Y. *J. Org. Chem.*, **1998**, 63, 2948.



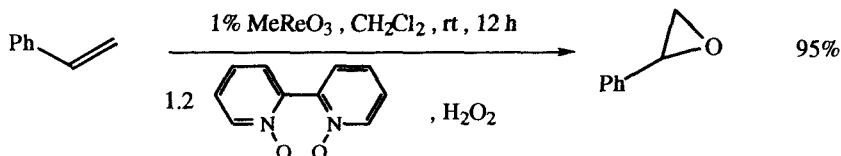
Denmark, S.E.; Wu, Z. *J. Org. Chem.*, **1998**, 63, 2810.



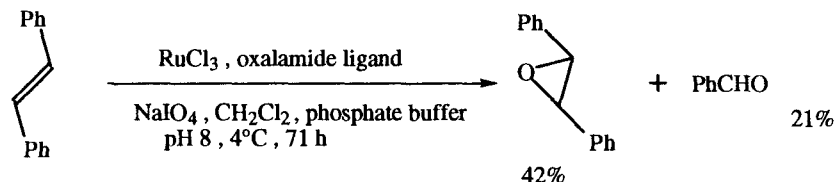
Karjalainen, J.K.; Hormi, O.E.D.; Sherrington, D.C. *Tetrahedron Asymmetry*, **1998**, 9, 3895



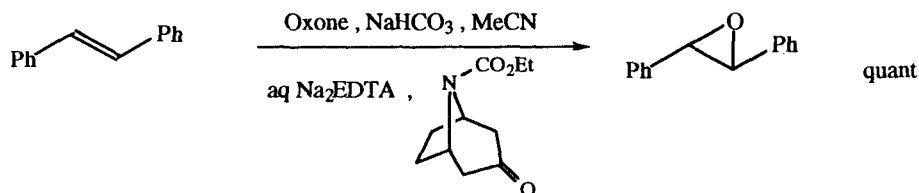
Ueno, S.; Yamaguchi, K.; Yoshida, K.; Ebitani, K.; Kaneda, K. *Chem. Commun.*, **1998**, 295



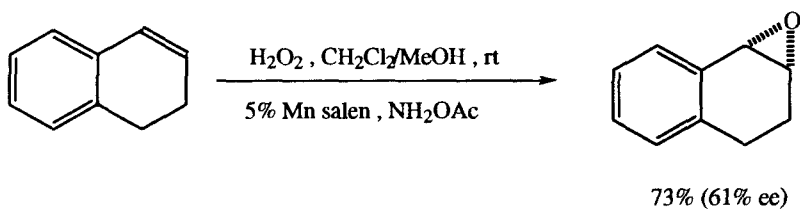
Nakajima, M.; Sasaki, Y.; Iwamoto, H.; Hashimoto, S. *Tetrahedron Lett.*, **1998**, 39, 87.



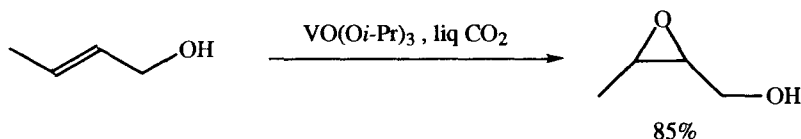
End, N.; Pfaltz, A. *Chem. Commun.*, **1998**, 589.



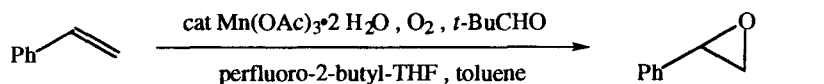
Armstrong, A.; Hayter, B.R. *Chem. Commun.*, **1998**, 621.



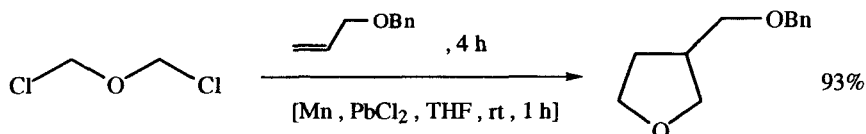
Pietikäinen, P. *Tetrahedron*, **1998**, 54, 4319.



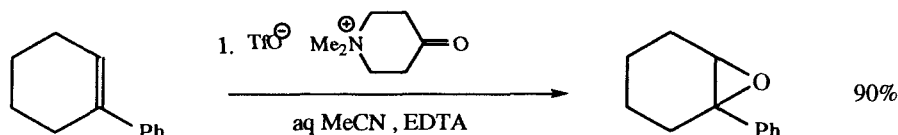
Pesiri, D.R.; Morita, D.K.; Glaze, W.; Tumas, W. *Chem. Commun.*, **1998**, 1015.



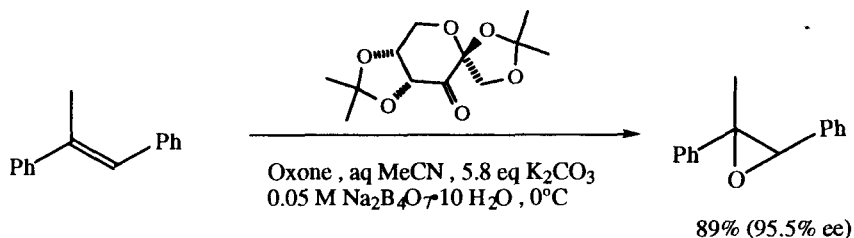
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Ravikumar, K.S.; Barbier, F.; Bégué, J.-P.; Bonnet-Delpon, D. *Tetrahedron*, **1998**, *54*, 7457

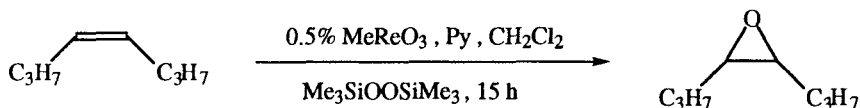
93%

Hojo, M.; Aihara, H.; Suginoara, Y.; Sakata, K.; Nakamura, S.; Murakami, C.; Hosomi, A. *J. Org. Chem.*, **1997**, *62*, 8610.

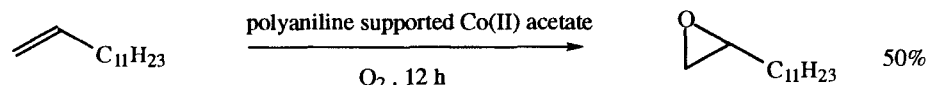
90%

2. Oxone, NaHCO<sub>3</sub>, 0°CDenmark, S.E.; Wu, Z. *J. Org. Chem.*, **1997**, *62*, 8767.

89% (95.5% ee)

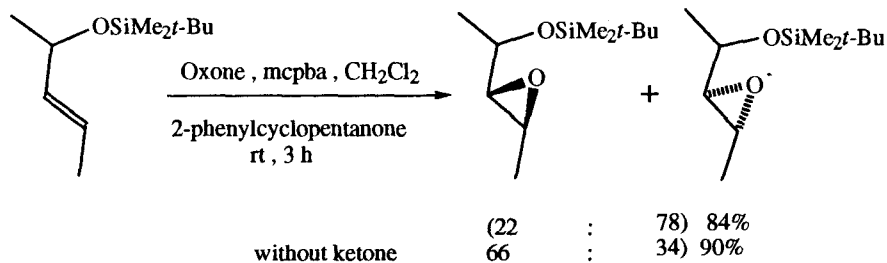
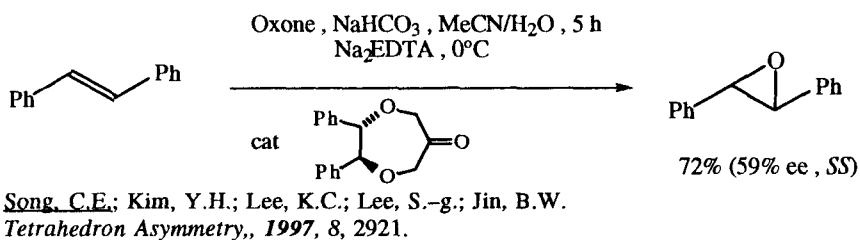
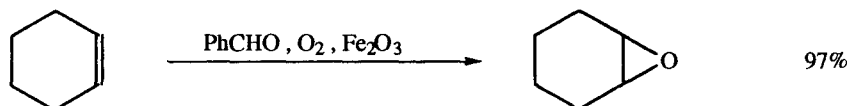
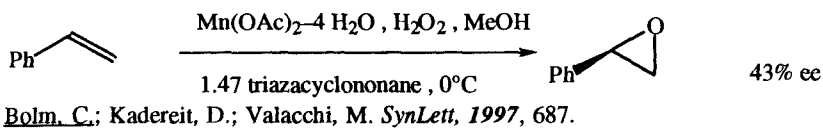
Wang, Z.-X.; Tu, Y.; Frohn, M.; Zhang, J.-R.; Shi, Y. *J. Am. Chem. Soc.*, **1997**, *119*, 11224.

92%

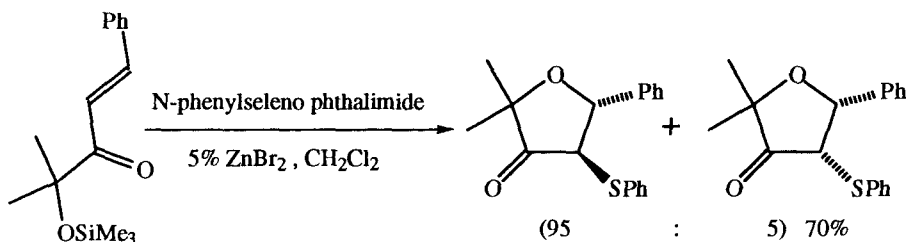
Yudin, A.K.; Sharpless, K.B. *J. Am. Chem. Soc.*, **1997**, *119*, 11536.

50%

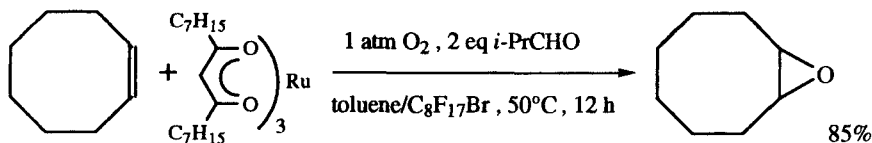
Das, B.C.; Iqbal, J. *Tetrahedron Lett.*, **1997**, *38*, 1235.



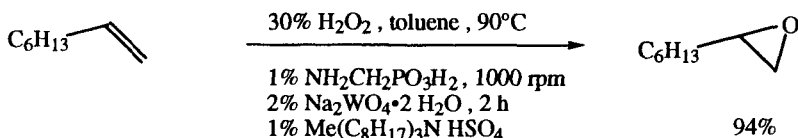
Kurihara, M.; Ishii, K.; Kasahara, Y.; Kameda, M.; Pathak, A.K.; Miyata, N. *Chem. Lett.*, **1997**, 1015.



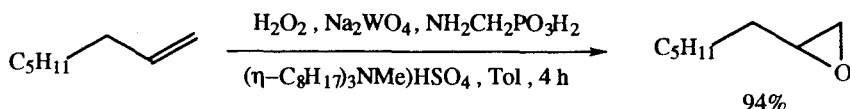
Colins, C.C.; Cronin, M.F.; Moynihan, H.A.; McCarthy, D.G. *J. Chem. Soc., Perkin Trans. 1*, **1997**, 1267.



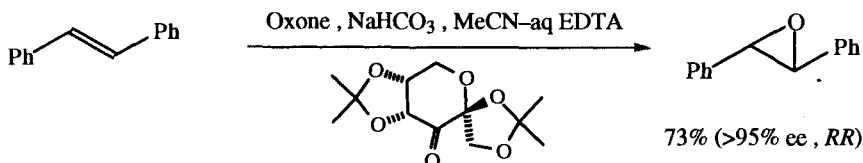
Klement, I.; Lütjens, H.; Knochel, P. *Angew. Chem. Int. Ed.*, **1997**, 36, 1454.



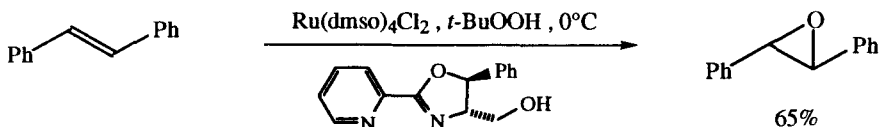
Sato, K.; Aoki, M.; Ogawa, M.; Hashimoto, T.; Panyella, D.; Noyori, R. *Bull. Chem. Soc. Jpn.*, **1997**, 70, 905.



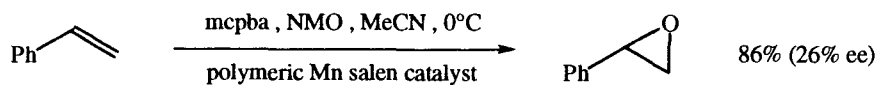
Sato, K.; Aoki, M.; Ogawa, M.; Hashimoto, T.; Noyori, R. *J. Org. Chem.*, **1996**, 61, 8310.



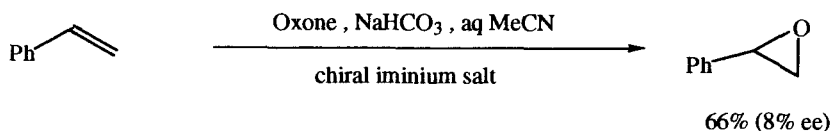
Tu, Y.; Wang, Z.-X.; Shi, Y. *J. Am. Chem. Soc.*, **1996**, 118, 9806.



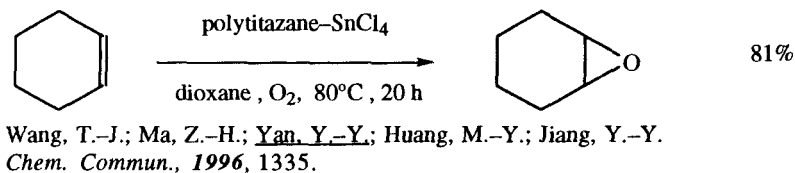
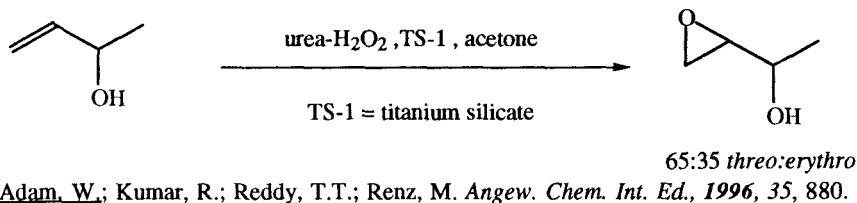
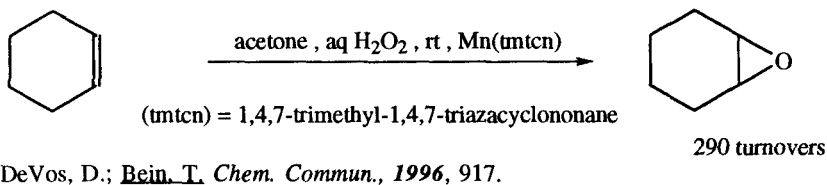
Barf, G.A.; van den Hoek, D.; Sheldon, R.A. *Tetrahedron*, **1996**, 52, 12971.



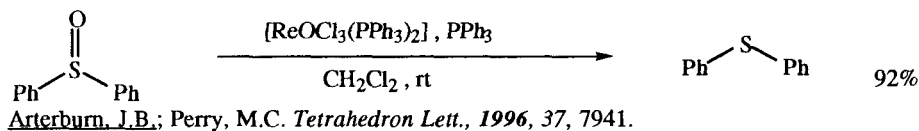
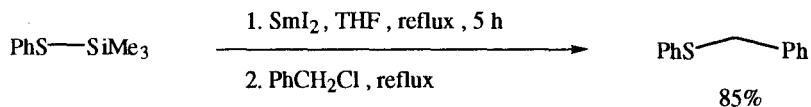
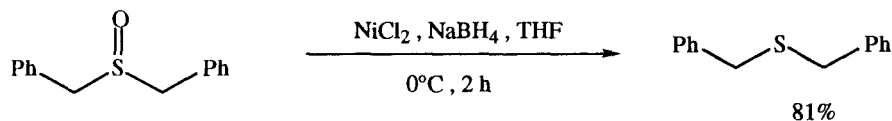
Minutolo, F.; Pini, D.; Petri, A.; Salvadori, P. *Tetrahedron Asymmetry*, **1996**, 7, 2293.



Aggarwal, V.K.; Wang, M.F. *Chem. Commun.*, **1996**, 191.



## SECTION 135: ETHERS, EPOXIDES AND THIOETHERS FROM MISCELLANEOUS COMPOUNDS



## CHAPTER 10

# PREPARATION OF HALIDES AND SULFONATES

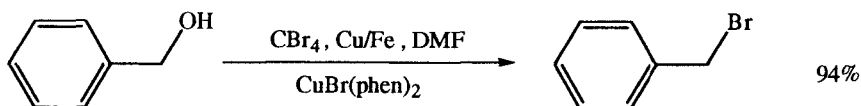
### SECTION 136: HALIDES AND SULFONATES FROM ALKYNES

NO ADDITIONAL EXAMPLES

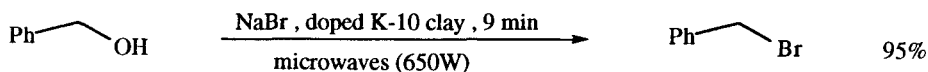
### SECTION 137: HALIDES AND SULFONATES FROM ACID DERIVATIVES

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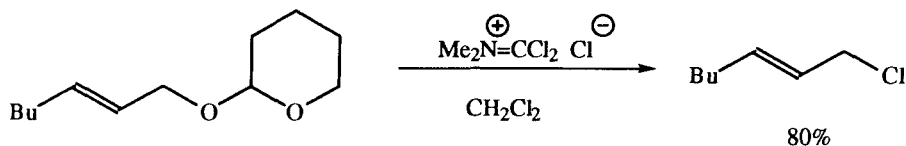
### SECTION 138: HALIDES AND SULFONATES FROM ALCOHOLS AND THIOLS



Léonel, E.; Paugam, J.P.; Nédélec, J.Y., *J. Org. Chem.*, **1997**, 62, 7061.

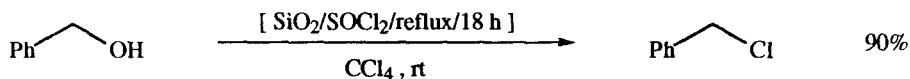


Kad, G.L.; Singh, V.; Kaur, K.P.; Singh, J. *Tetrahedron Lett.*, **1997**, 38, 1079.

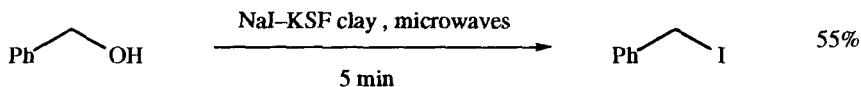


Schlama, T.; Gouverneur, V.; Misokowski, C., *Tetrahedron Lett.*, **1997**, 38, 3517.





Mohanazadeh, E.; Momeni, A.R. *Org. Prep. Proceed. Int.*, **1996**, 28, 492.



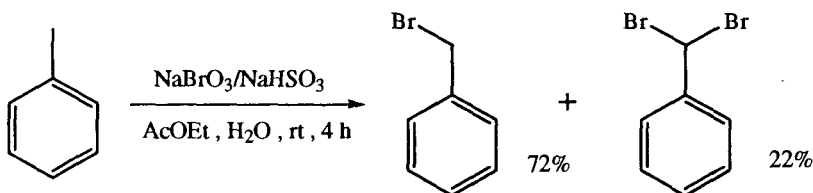
Kad, G.L.; Kaur, J.; Bansal, P.; Singh, J. *J. Chem. Res. (S)*, **1996**, 188.

### SECTION 139: HALIDES AND SULFONATES FROM ALDEHYDES

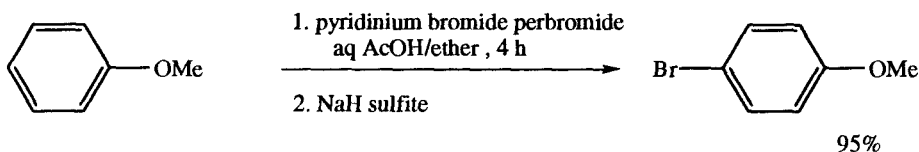
NO ADDITIONAL EXAMPLES

### SECTION 140: HALIDES AND SULFONATES FROM ALKYL, METHYLENES AND ARYLS

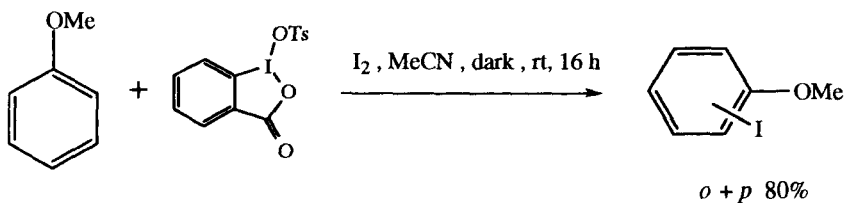
For the conversion  $\text{R-H} \rightarrow \text{R-Halogen}$ , see Section 146 (Halides from Hydrides).



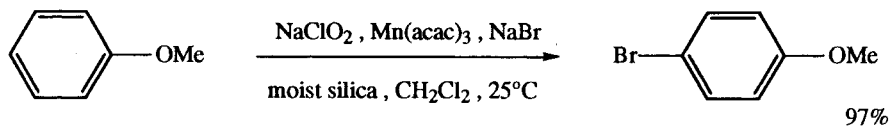
Kikuchi, D.; Sakaguchi, S.; Ishii, Y. *J. Org. Chem.*, **1998**, 63, 6023.



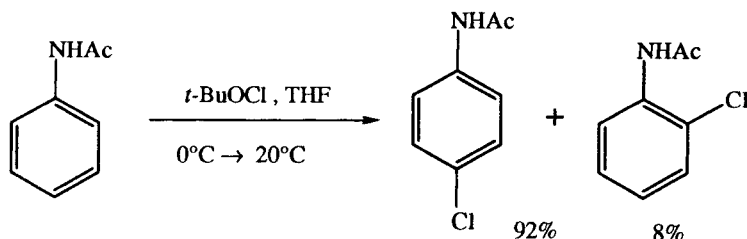
Reeves, W.P.; Lu, C.V.; Schlmeier, B.; Jonas, L.; Hatlevik, O. *Synth. Commun.*, **1998**, 28, 499.



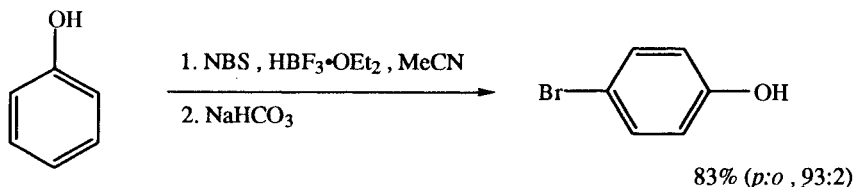
Muraki, T.; Togo, H.; Yokoyama, M. *SynLett*, **1998**, 286.



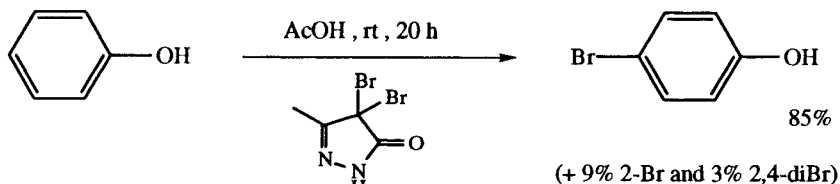
Hirano, M.; Monobe, H.; Takabe, S.; Morimoto, T. *Synth. Commun.*, **1998**, 28, 1463.



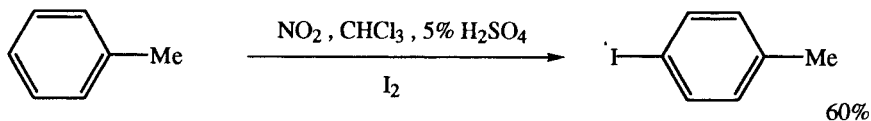
Lengyel, I.; Cesare, V.; Stephani, R. *Synth. Commun.*, **1998**, 28, 1891.



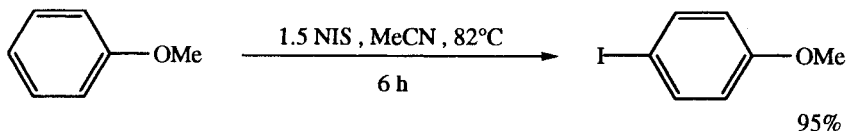
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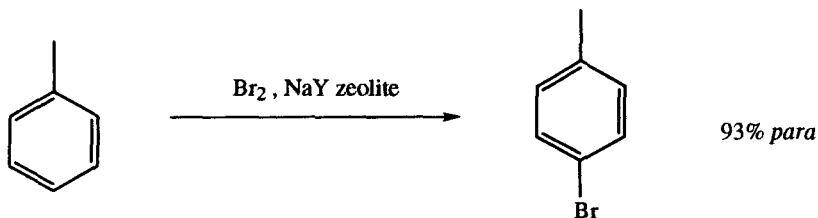
Mashraqui, S.H.; Mudaliar, C.D.; Hariharasubrahmanian, H. *Tetrahedron Lett.*, **1997**, 38, 4865



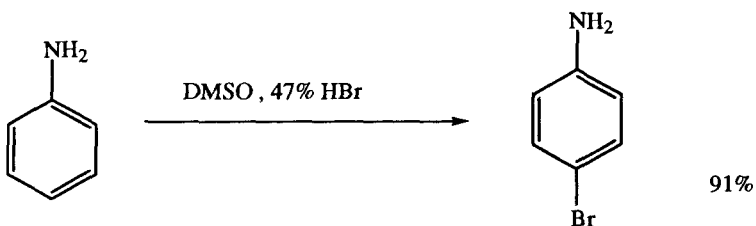
Noda, Y.; Kashima, M. *Tetrahedron Lett.*, **1997**, 38, 6225.



Carreño, M.C.; García Ruano, J.L.; Sanz, G.; Toledo, M.A.; Urbano, A. *Tetrahedron Lett.*, **1996**, 37, 4081.



Smith, K.; Bahzad, D. *Chem. Commun.*, **1996**, 467.

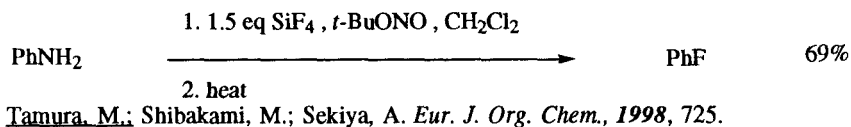


Srivastava, S.K.; Chauhan, P.M.S.; Bhaduri, A.P. *Chem. Commun.*, **1996**, 2679.

## SECTION 141: HALIDES AND SULFONATES FROM AMIDES

NO ADDITIONAL EXAMPLES

## SECTION 142: HALIDES AND SULFONATES FROM AMINES



Tamura, M.; Shibakami, M.; Sekiya, A. *Eur. J. Org. Chem.*, **1998**, 725.

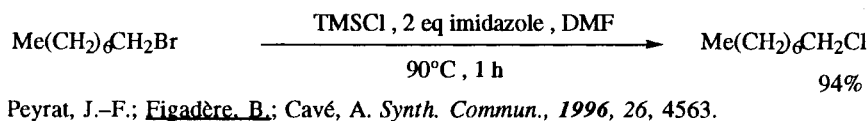
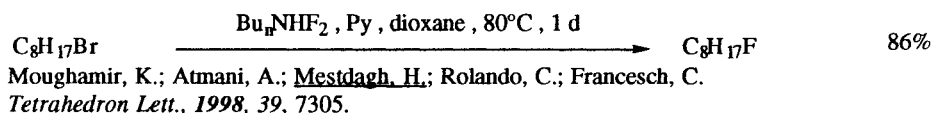
## SECTION 143: HALIDES AND SULFONATES FROM ESTERS

NO ADDITIONAL EXAMPLES

## SECTION 144: HALIDES AND SULFONATES FROM ETHERS, EPOXIDES AND THIOETHERS

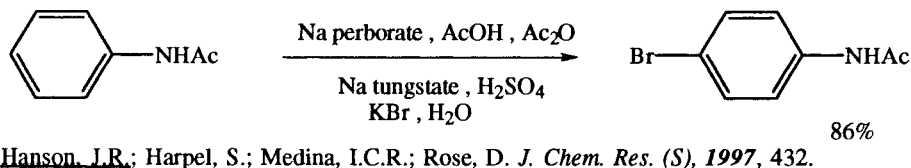
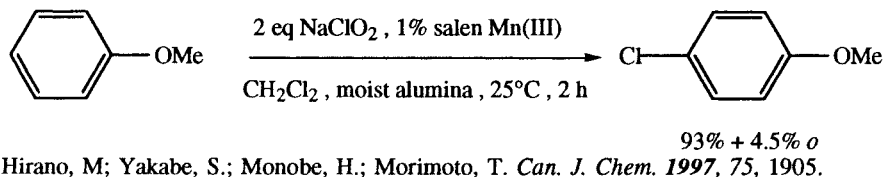
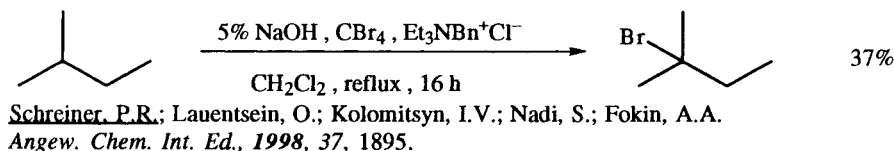
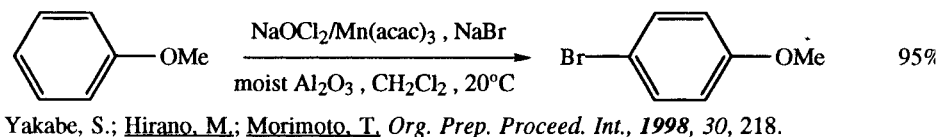
NO ADDITIONAL EXAMPLES

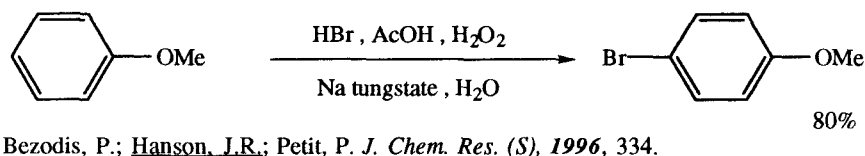
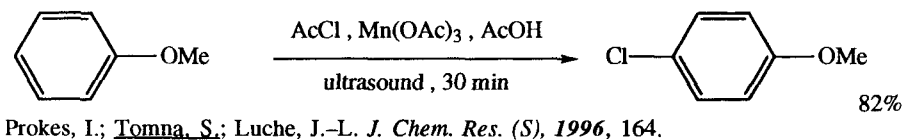
## SECTION 145: HALIDES AND SULFONATES FROM HALIDES AND SULFONATES



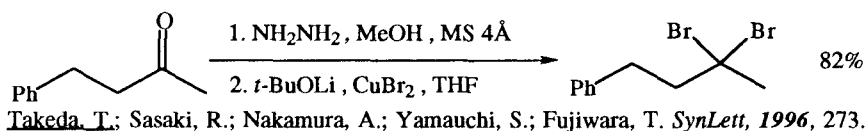
## SECTION 146: HALIDES AND SULFONATES FROM HYDRIDES

$\alpha$ -Halogenations of aldehydes, ketones and acids are found in Sections 338 (Halide-Aldehyde), 369 (Halide-Ketone), 359 (Halide-Esters) and 319 (Halide-Acids).





## SECTION 147: HALIDES AND SULFONATES FROM KETONES

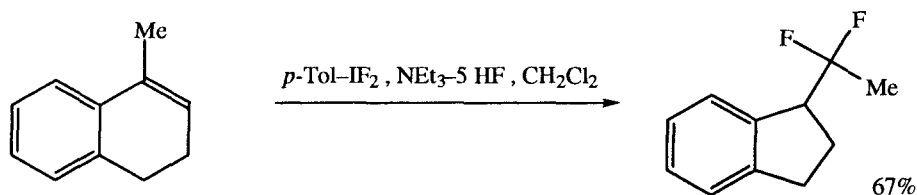
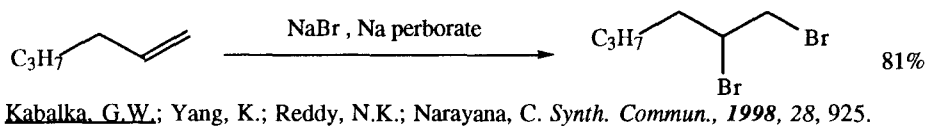


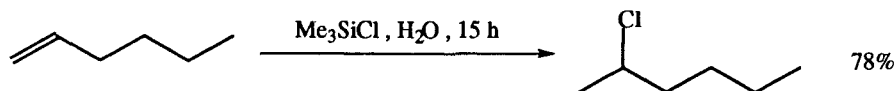
## SECTION 148: HALIDES AND SULFONATES FROM NITRILES

NO ADDITIONAL EXAMPLES

## SECTION 149: HALIDES AND SULFONATES FROM ALKENES

For halocyclopropanations, see Section 74E (Alkyls from Alkenes).

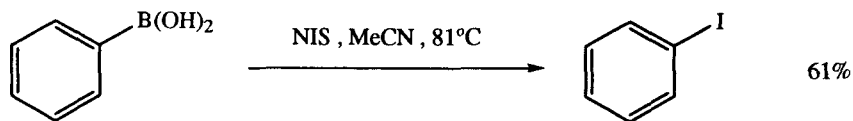




Boudjouk, P.; Kim, B.-K.; Han, B.-H. *Synth. Commun.*, **1996**, 26, 3479.

## SECTION 150:

## HALIDES AND SULFONATES FROM MISCELLANEOUS COMPOUNDS



Thiebes, C.; Prakash, G.K.S.; Petasis, N.A.; Olah, G.A. *SynLett*, **1998**, 141.

## CHAPTER 11

### PREPARATION OF HYDRIDES

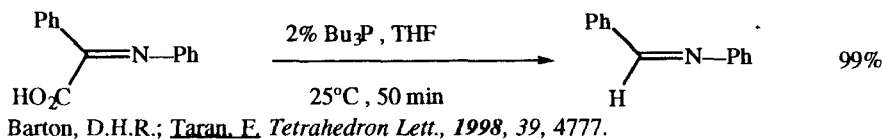
This chapter lists hydrogenolysis and related reactions by which functional groups are replaced by hydrogen: e.g.  $\text{RCH}_2\text{X} \rightarrow \text{RCH}_2\text{-H}$  or  $\text{R-H}$ .

#### SECTION 151: HYDRIDES FROM ALKYNES

NO ADDITIONAL EXAMPLES

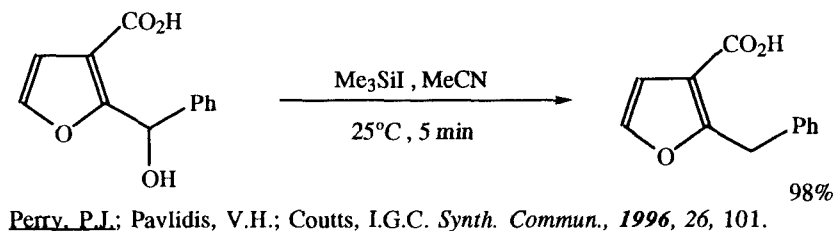
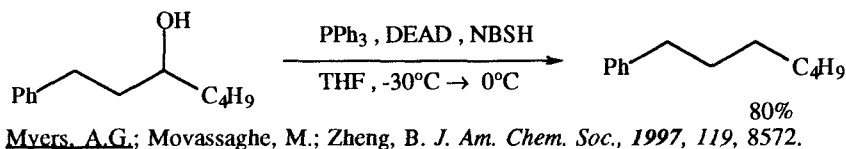
#### SECTION 152: HYDRIDES FROM ACID DERIVATIVES

This section lists examples of decarboxylations ( $\text{RCO}_2\text{H} \rightarrow \text{R-H}$ ) and related reactions



#### SECTION 153: HYDRIDES FROM ALCOHOLS AND THIOLS

This section lists examples of the hydrogenolysis of alcohols and phenols ( $\text{ROH} \rightarrow \text{R-H}$ ).



Also via: Section 160 (Halides and Sulfonates).

## SECTION 154: HYDRIDES FROM ALDEHYDES

For the conversion  $\text{RCHO} \rightarrow \text{R-Me}$ , etc., see Section 64 (Alkyls from Aldehydes).

NO ADDITIONAL EXAMPLES

## SECTION 155: HYDRIDES FROM ALKYL, METHYLENES AND ARYL

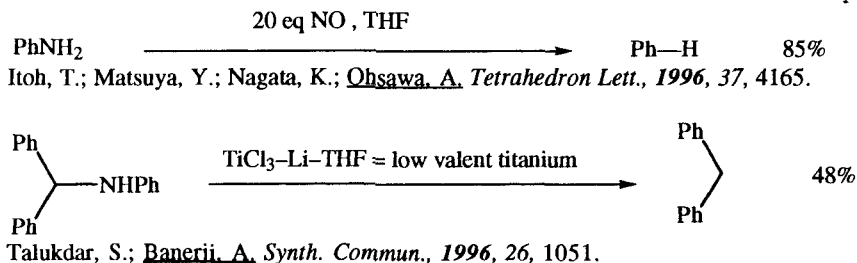
NO ADDITIONAL EXAMPLES

## SECTION 156: HYDRIDES FROM AMIDES

NO ADDITIONAL EXAMPLES

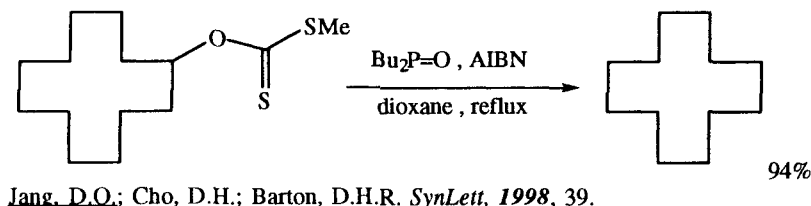
## SECTION 157: HYDRIDES FROM AMINES

This section lists examples of the conversion  $\text{RNH}_2$  (or  $\text{R}_2\text{NH}$ )  $\rightarrow$   $\text{R-H}$ .

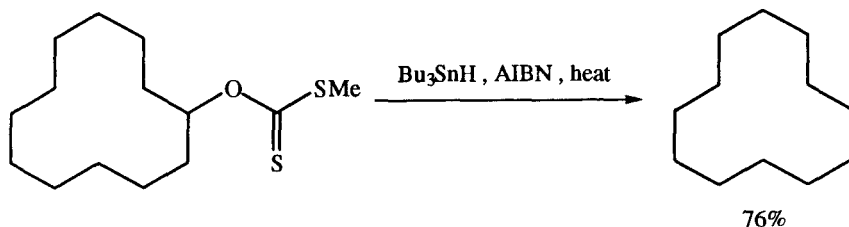


## SECTION 158: HYDRIDES FROM ESTERS

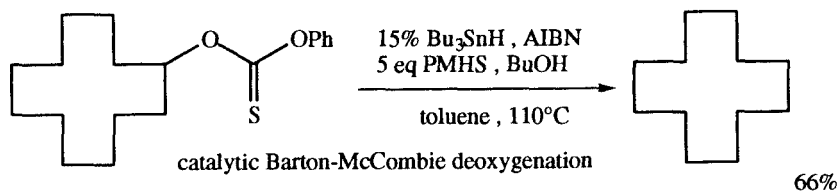
This section lists examples of the reactions  $\text{RCO}_2\text{R}' \rightarrow \text{R-H}$  and  $\text{RCO}_2\text{R}' \rightarrow \text{R'H}$ .







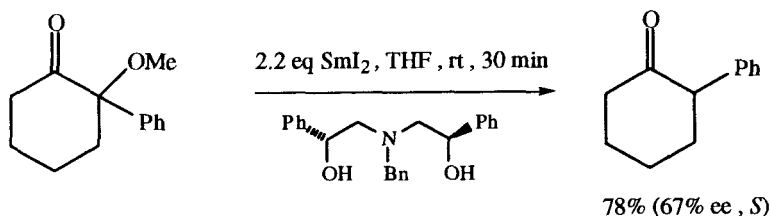
Jang, D.O.; Cho, D.H.; Kim, J. *Synth. Commun.*, **1998**, 28, 3559.



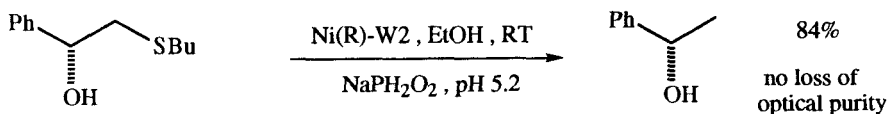
Lopez, R.M.; Hays, D.S.; Fu, G.C. *J. Am. Chem. Soc.*, **1997**, 119, 6949.

## SECTION 159: HYDRIDES FROM ETHERS, EPOXIDES AND THIOETHERS

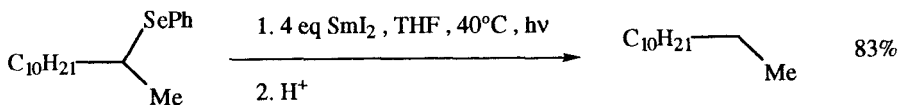
This section lists examples of the reaction  $R-O-R' \rightarrow R-H$ .



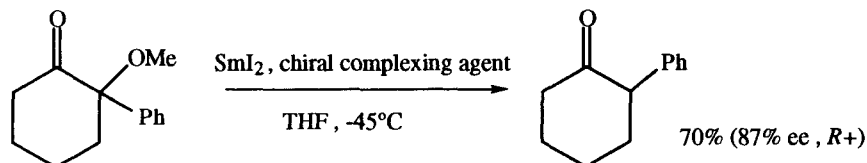
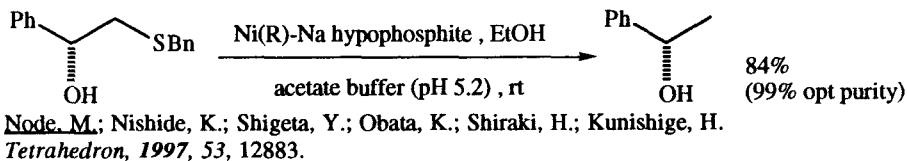
Mikami, K.; Yamaoka, M.; Yoshida, A. *SynLett*, **1998**, 607.



Nishide, K.; Shigeta, Y.; Obata, K.; Inoue, T.; Node, M. *Tetrahedron Lett.*, **1998**, 37, 2271.

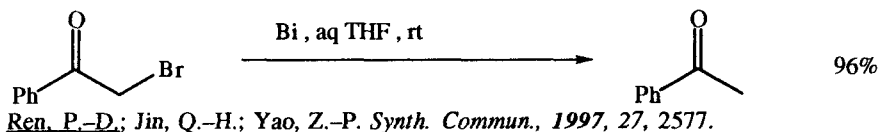
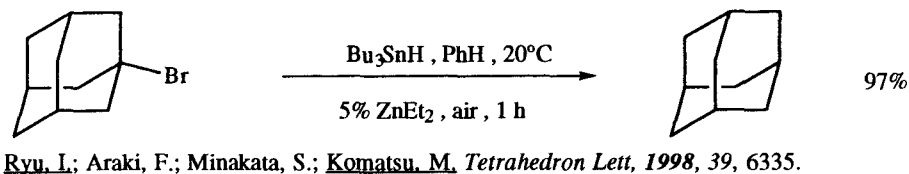
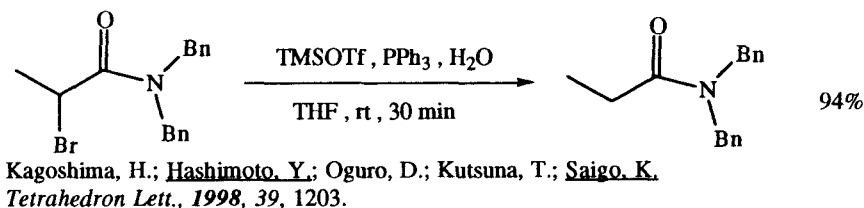
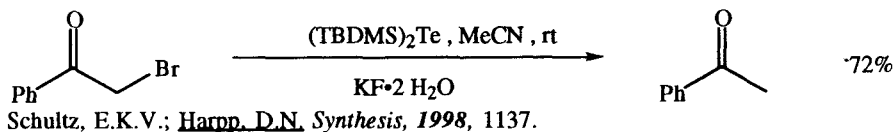


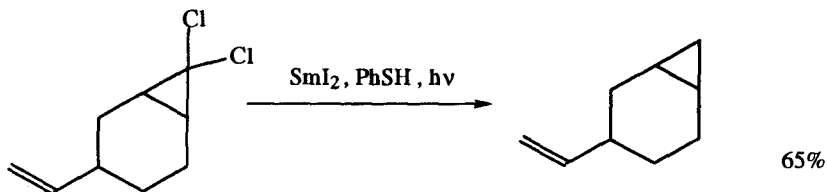
Ogawa, A.; Ohya, S.; Doi, M.; Sumino, Y.; Sonoda, N.; Hirao, T. *Tetrahedron Lett.* **1998**, 39, 6341.



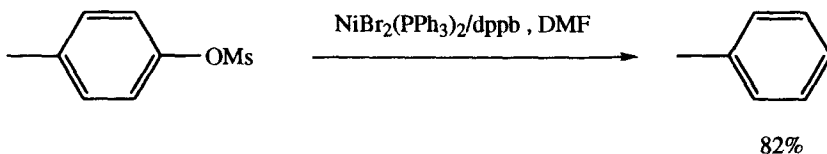
## SECTION 160: HYDRIDES FROM HALIDES AND SULFONATES

This section lists the reductions of halides and sulfonates,  $\text{R-X} \rightarrow \text{R-H}$ .

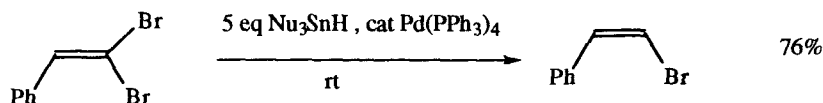




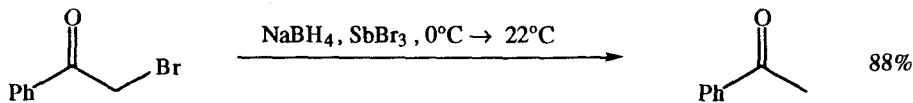
Ogawa, A.; Ohya, S.; Hirao, T. *Chem. Lett.*, **1997**, 275.



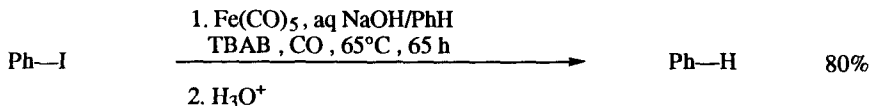
Sasaki, K.; Kubo, T.; Sakai, M.; Kuroda, Y. *Chem. Lett.*, **1997**, 617.



Uenishi, J.; Kawahama, R.; Shiga, Y.; Yonemitsu, O.; Tsuji, J. *Tetrahedron Lett.*, **1996**, 37, 6759.



Sayama, S.; Inamura, Y. *Chem. Lett.*, **1996**, 633.



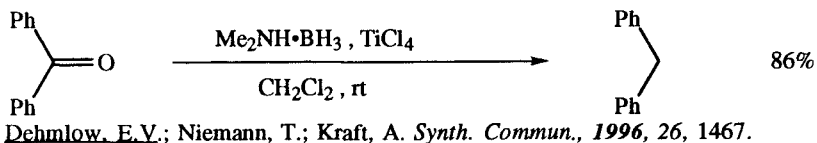
Brunet, J.-L.; El Zaizi, A. *Bull. Soc. Chim. Fr.*, **1996**, 133, 75.

## SECTION 161: HYDRIDES FROM HYDRIDES

NO ADDITIONAL EXAMPLES

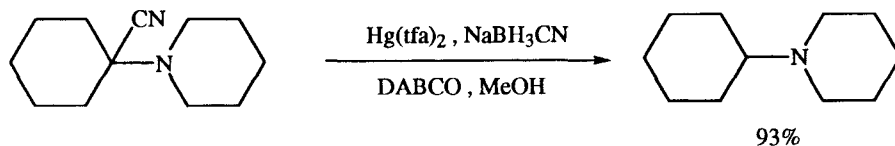
## SECTION 162: HYDRIDES FROM KETONES

This section lists examples of the reaction  $\text{R}_2\text{C}(\text{C}=\text{O})\text{R} \rightarrow \text{R}_2\text{C-H}$ .



### SECTION 163: HYDRIDES FROM NITRILES

This section lists examples of the reaction,  $\text{R}-\text{C}\equiv\text{N} \rightarrow \text{R}-\text{H}$  (includes reactions of isonitriles ( $\text{R}-\text{N}\equiv\text{C}$ )).

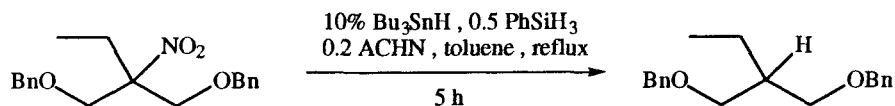


Sassman, M.B. *Tetrahedron*, **1996**, 52, 10835.

### SECTION 164: HYDRIDES FROM ALKENES

NO ADDITIONAL EXAMPLES

### SECTION 165: HYDRIDES FROM MISCELLANEOUS COMPOUNDS

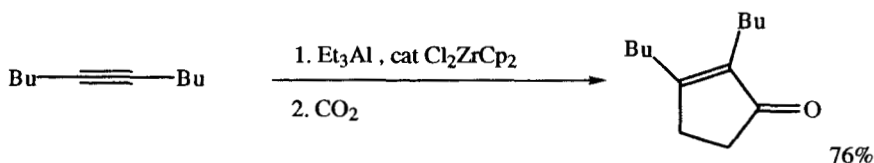


Tormo, J.; Hays, D.S.; Fu, G.C. *J. Org. Chem.*, **1998**, 63, 5296.

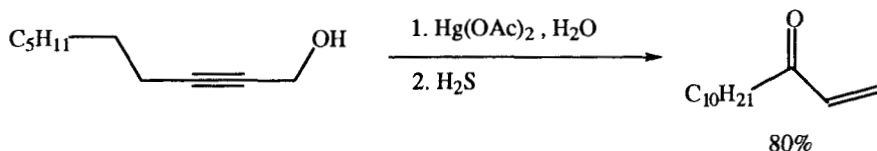
## CHAPTER 12

### PREPARATION OF KETONES

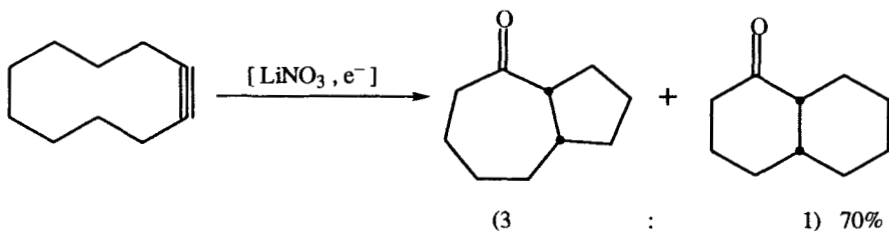
#### SECTION 166: KETONES FROM ALKYNES



Negishi, E.; Montchamp, J.-L.; Anastasia, L.; Elizarov, A.; Choueiry, D.  
*Tetrahedron Lett.*, **1998**, 39, 2503.

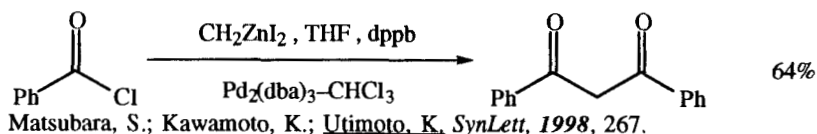


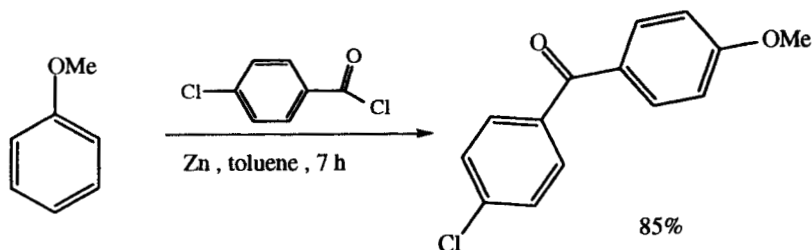
Yadav, J.S.; Prahlad, V.; Muralidhar, B. *Synth. Commun.*, **1997**, 27, 3415.



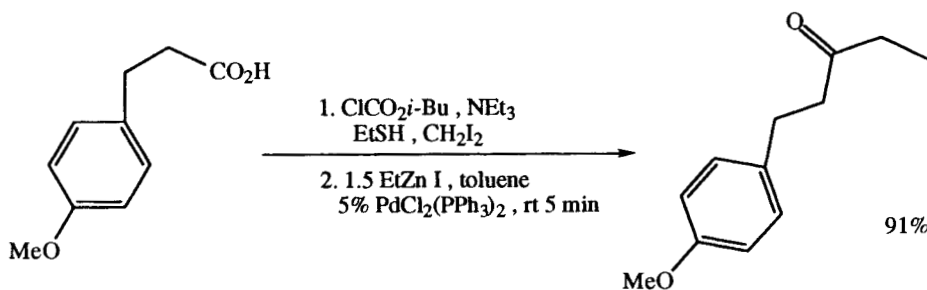
Wille, U.; Plath, C. *Liebigs Ann. Chem.*, **1997**, 111.

#### SECTION 167: KETONES FROM ACID DERIVATIVES

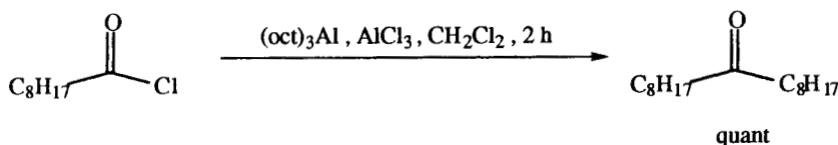




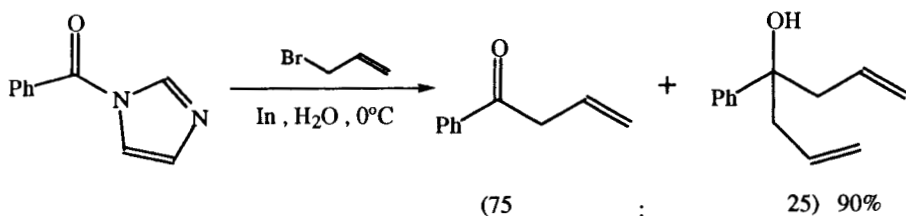
Meshram, H.M.; Reddy, G.S.; Reddy, M.M.; Yadav, J.S. *Synth. Commun.*, **1998**, 28, 2203.



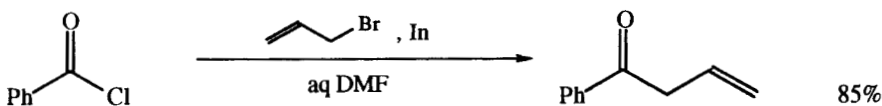
Tokuyama, H.; Yokoshima, S.; Yamashita, T.; Fukuyama, T. *Tetrahedron Lett.*, **1998**, 39, 3189.



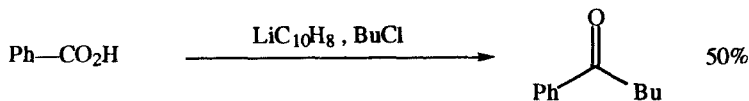
Arisawa, M.; Torisawa, Y.; Kawahara, M.; Yamanaka, M.; Nishida, A.; Nakagawa, M. *J. Org. Chem.*, **1997**, 62, 4327.



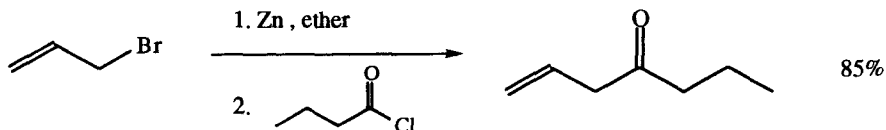
Bryann, V.J.; Chan, T.-H. *Tetrahedron Lett.*, **1997**, 38, 6493.



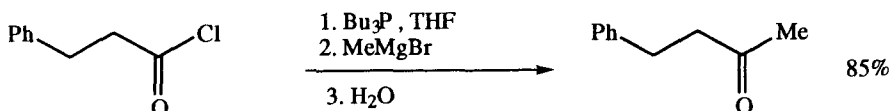
Yadav, J.S.; Srinivas, D.; Reddy, G.S.; Bindhu, K.H. *Tetrahedron Lett.*, **1997**, 38, 8745.



Alonso, F.; Lorenzo, E.; Yus, M. *J. Org. Chem.*, **1996**, *61*, 6058.

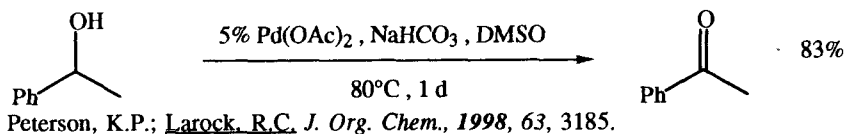


Ranu, B.C.; Majee, A.; Das, A.R. *Tetrahedron Lett.*, **1996**, *37*, 1109.

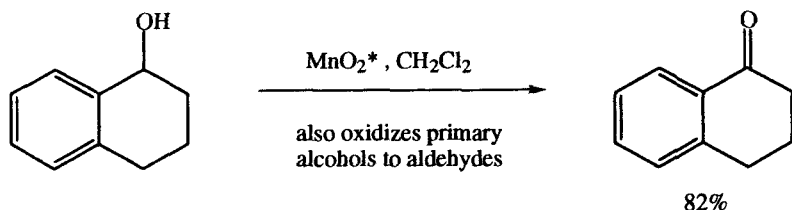


Maeda, H.; Okamoto, J.; Ohmori, H. *Tetrahedron Lett.*, **1996**, *37*, 5381.

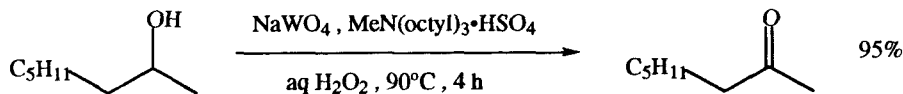
## SECTION 168: KETONES FROM ALCOHOLS AND THIOLS



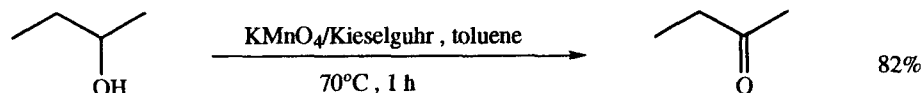
Peterson, K.P.; Larock, R.C. *J. Org. Chem.*, **1998**, *63*, 3185.



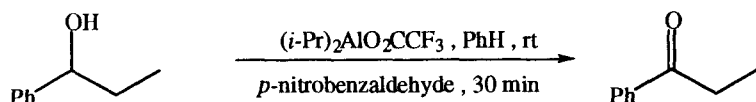
Aoyama, T.; Sonoda, N.; Yamauchi, M.; Toriyama, K.; Anzai, M.; Ando, A.; Shioiri, T. *SynLett*, **1998**, 35.



Sato, K.; Aoki, M.; Takagi, J.; Noyori, R. *J. Am. Chem. Soc.*, **1997**, *119*, 12386.

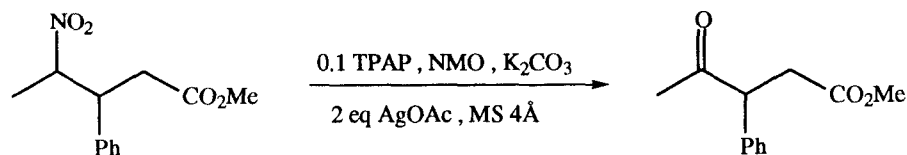


Lou, J.-D.; Lou, W.-X. *Synth. Commun.*, **1997**, *27*, 3697.



new Oppenauer oxidation catalyst

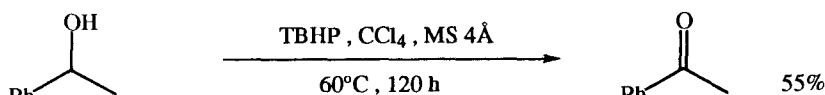
Akamanchi, K.G.; Chaudhari, B.A. *Tetrahedron Lett.*, **1997**, 38, 6925.



TPAP = tetrapropylammonium perruthenate

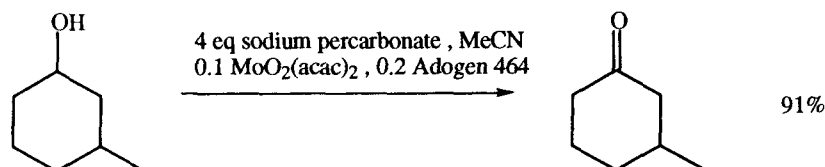
89%

Tokunaga, Y.; Thara, M.; Fukumoto, K. *J. Chem. Soc., Perkin Trans. 1*, **1997**, 207.



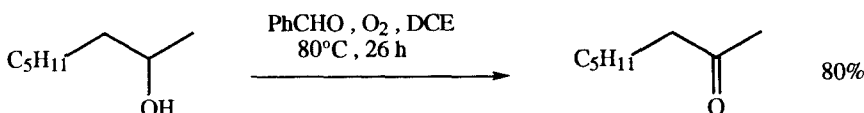
55%

Palombi, L.; Arista, L.; Lattanzi, A.; Bonadies, F.; Scretti, A. *Tetrahedron Lett.*, **1996**, 37, 7849.



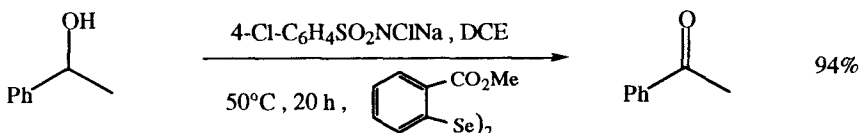
91%

Maignien, S.; Ait-Mohand, S.; Muzart, J. *SynLett*, **1996**, 439.



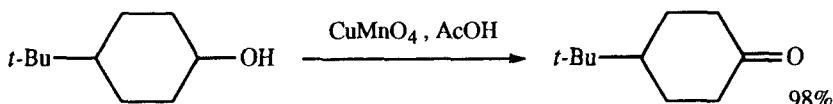
80%

Choudary, B.M.; Sudha, Y. *Synth. Commun.*, **1996**, 26, 1651.



94%

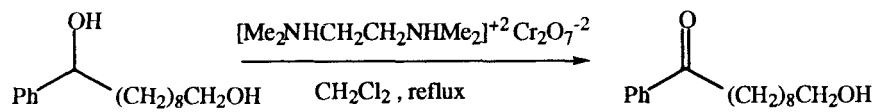
Onami, T.; Ikeda, M.; Woodward, S.S. *Bull. Chem. Soc. Jpn.*, **1996**, 69, 3601.



98%

Ansari, M.A.; Craig, J.C. *Synth. Commun.*, **1996**, 26, 1789.



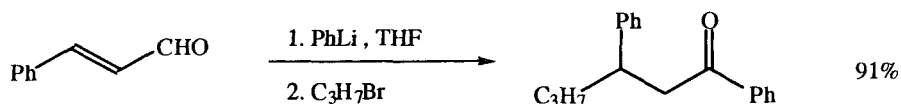


70%

Chandrasekhar, S.; Takhi, M.; Mohapatra, S. *Synth. Commun.*, **1996**, 26, 3947.

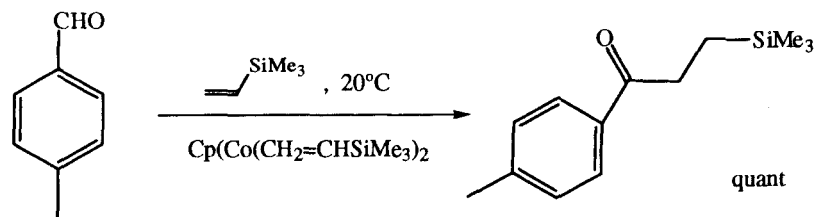
Related Methods: Section 48 (Aldehydes from Alcohols and Phenols).

## SECTION 169: KETONES FROM ALDEHYDES



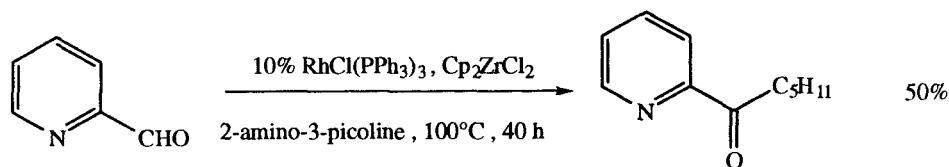
91%

Nudelman, N.S.; García, G.V.; Schulz, H.G. *J. Org. Chem.*, **1998**, 63, 5730.



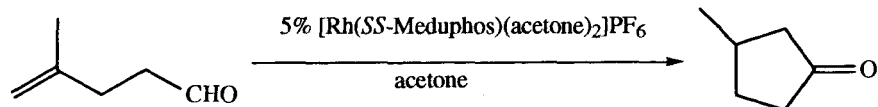
quant

Lenges, C.P.; Brookhart, M. *J. Am. Chem. Soc.*, **1997**, 119, 3165.



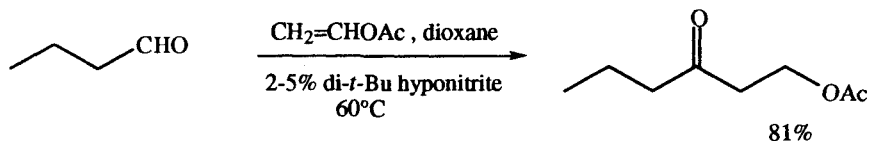
50%

Jun, C.-H.; Lee, D.-Y.; Hong, J.-B. *Tetrahedron Lett.*, **1997**, 38, 6673.



95% (94% ee)

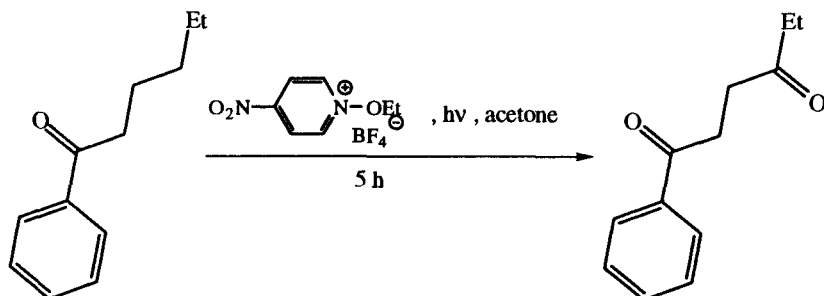
Barnhart, R.W.; McMorran, D.A.; Bosnich, B. *Chem. Commun.*, **1997**, 589.



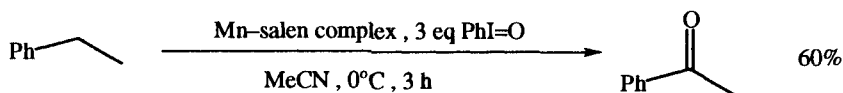
Dang, H.-S.; Roberts, B.P. *Chem. Commun.*, **1996**, 2201.

## SECTION 170: KETONES FROM ALKYL, METHYLENES AND ARYL

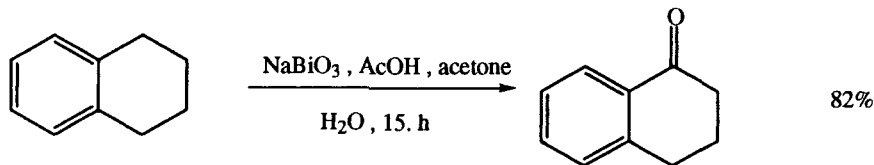
This section lists examples of the reaction,  $\text{R-CH}_2\text{-R}' \rightarrow \text{R(C=O)-R}'$ .



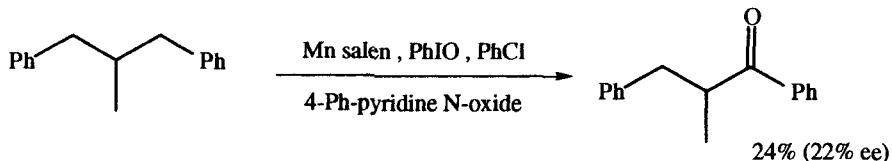
Negele, S.; Wieser, K.; Severin, T. *J. Org. Chem.*, **1998**, 63, 1138.



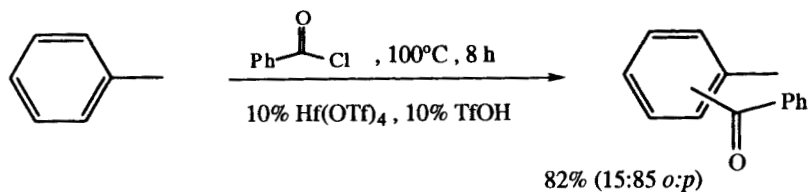
Lee, N.H.; Lee, C.-S.; Jung, D.-S. *Tetrahedron Lett.*, **1998**, 39, 1385.



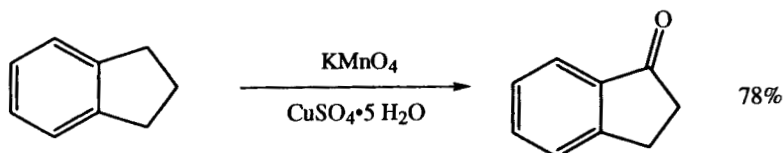
Banik, B.K.; Venkatraman, M.S.; Mukhopadhyay, C.; Becker, F.F. *Tetrahedron Lett.*, **1998**, 39, 7247.



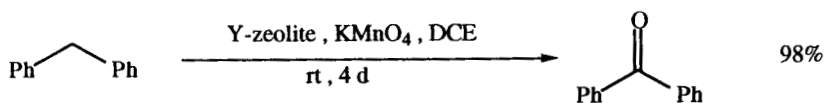
Komiya, N.; Noji, S.; Murahashi, S.-I. *Tetrahedron Lett.*, **1998**, 39, 7921.



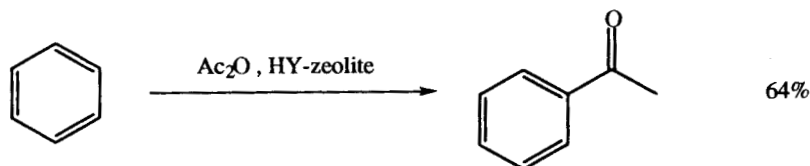
Kobayashi, S.; Iwamoto, S. *Tetrahedron Lett.*, **1998**, 39, 4697.



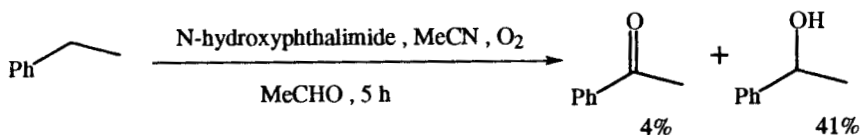
Noureddin, N.A.; Zhao, D.; Lee, D.G. *J. Org. Chem.*, **1997**, 62, 8767.



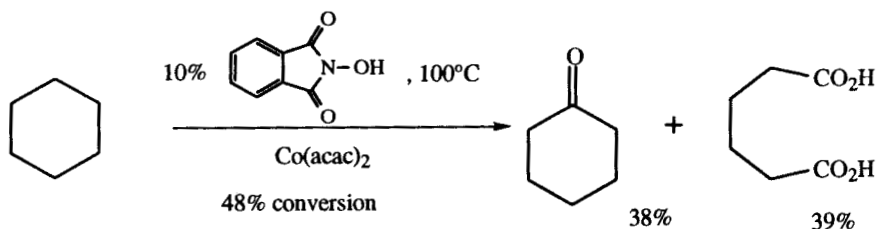
Sreekumar, R.; Padmakumar, R. *Tetrahedron Lett.*, **1997**, 38, 5143.



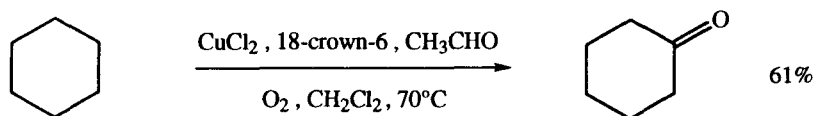
Sreekumar, R.; Padmakumar, R. *Synth. Commun.*, **1997**, 27, 777.



Einhorn, C.; Einhorn, J.; Marcadal, C.; Pierre, J.-L. *Chem. Commun.*, **1997**, 447.

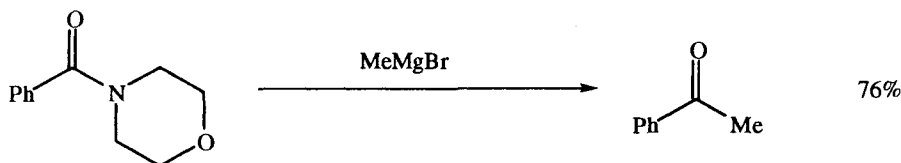


Ishii, Y.; Iwahara, T.; Sakaguchi, S.; Nakayama, K.; Nishiyama, Y. *J. Org. Chem.*, **1996**, 61, 4520.



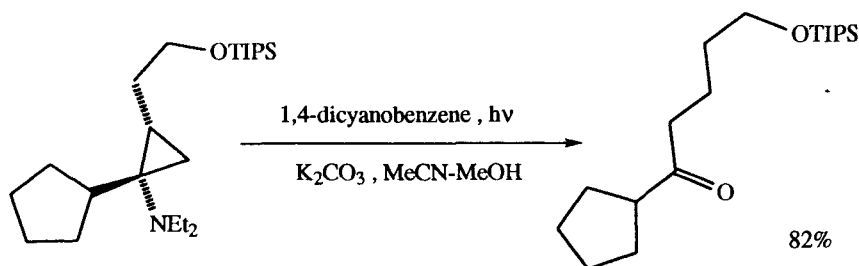
Koniya, N.; Naota, T.; Murahashi, S.-I. *Tetrahedron Lett.*, **1996**, 37, 1633.

## SECTION 171: KETONES FROM AMIDES

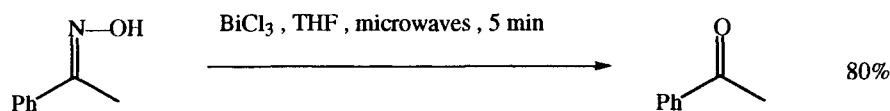


Martín, R.; Romea, P.; Tey, C.; Urfí, F.; Vilarrasa, J. *SynLett*, **1997**, 1414.

## SECTION 172: KETONES FROM AMINES

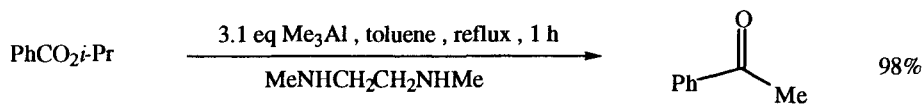


Lee, J.; Sun, U.J.; Blackstock, S.C.; Cha, J.K. *J. Am. Chem. Soc.*, **1997**, 119, 10241.

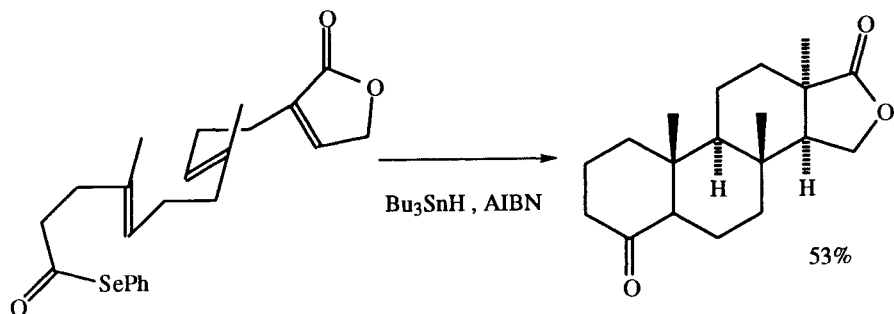


Boruah, A.; Baruah, B.; Prajapati, D.; Sandhu, J.S. *Tetrahedron Lett.*, **1997**, 38, 4267.

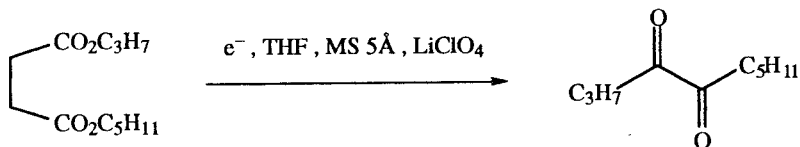
## SECTION 173: KETONES FROM ESTERS



Chung, E.-A.; Cho, C.-W.; Ahn, K.H. *J. Org. Chem.*, **1998**, 63, 7590.

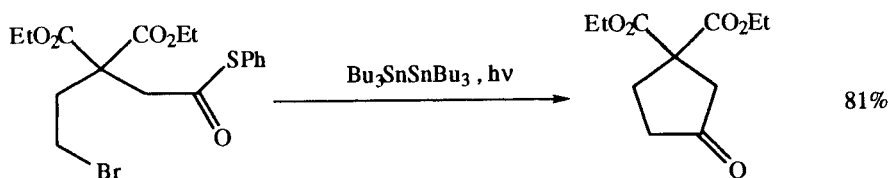


Pattenden, G.; Roberts, L.; Blake, A.J. *J. Chem. Soc., Perkin Trans. 1*, **1998**, 8630.

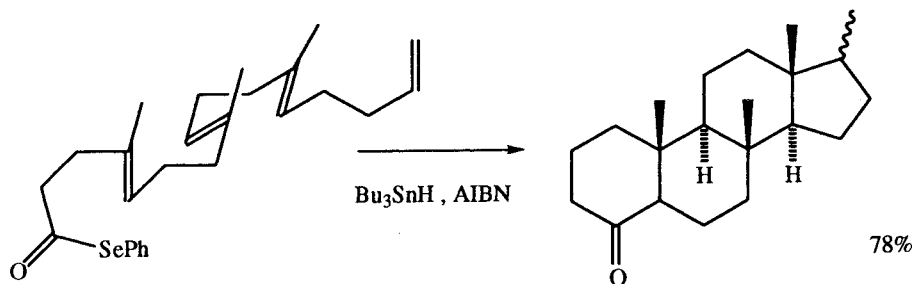


81%

Kashimura, S.; Murai, Y.; Washika, C.; Yoshihara, D.; Kataoka, Y.; Murase, H.; Shono, T. *Tetrahedron Lett*, **1997**, 38, 6717.

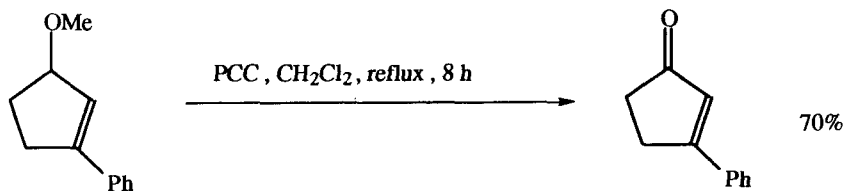


Kim, S.; Jon, S.Y. *Chem. Commun.*, **1996**, 1335.

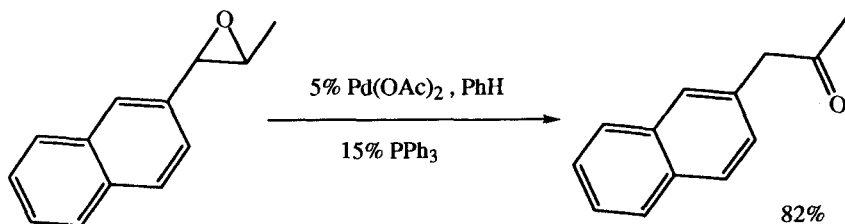


Batsanov, A.; Chen, L.; Gill, G.B.; Pattenden, G. *J. Chem. Soc., Perkin Trans. 1*, **1996**, 45.

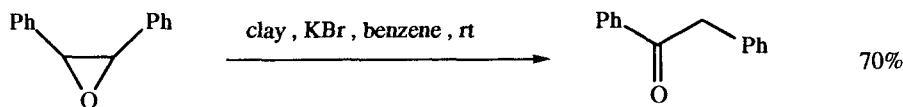
## SECTION 174: KETONES FROM ETHERS, EPOXIDES AND THIOETHERS



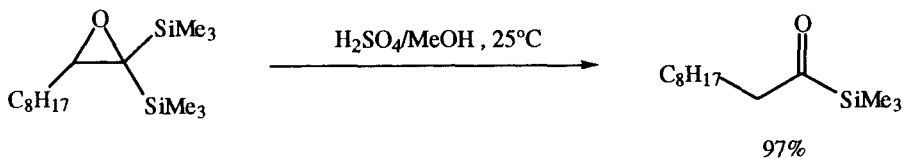
Cossy, J.; Bouzbouz, S.; Lachgar, M.; Hakiki, A.; Tabyaoui, B. *Tetrahedron Lett.*, **1998**, 39, 2561.



Kulasegaram, S.; Kulawiec, R.J. *J. Org. Chem.*, **1997**, 62, 6547.

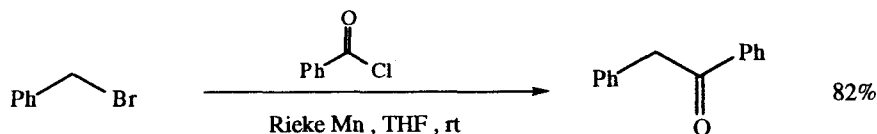


Martínez, R.; Velasco, M.; Martínez, I.; Menconi, I.; Ramírez, A.; Angeles, E.; Regla, I.; López, R. *J. Heterocyclic Chem.*, **1997**, 34, 1865.

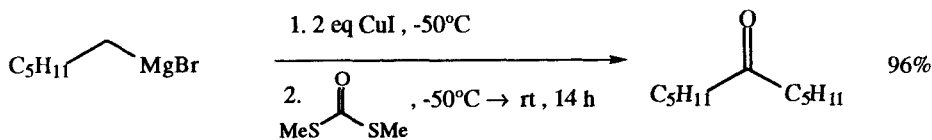


Hodgson, D.M.; Comina, P.J. *Chem. Commun.*, **1996**, 755.

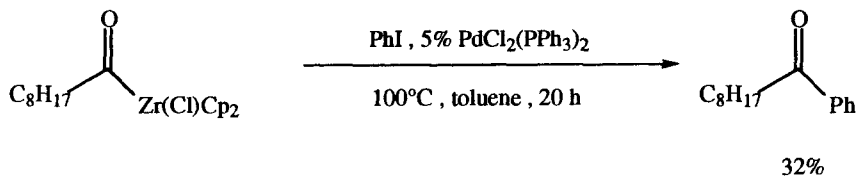
## SECTION 175: KETONES FROM HALIDES AND SULFONATES



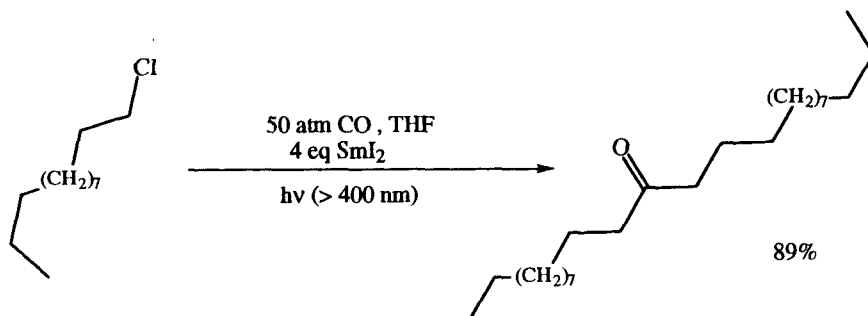
Kim, S.-H.; Rieke, R.D. *J. Org. Chem.*, **1998**, 63, 6766.



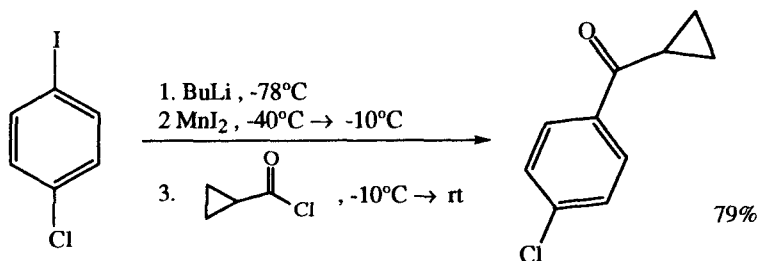
Chen, C.-D.; Huang, J.-W.; Leung, M.-k.; Li, H.-h. *Tetrahedron*, **1998**, *54*, 4067.



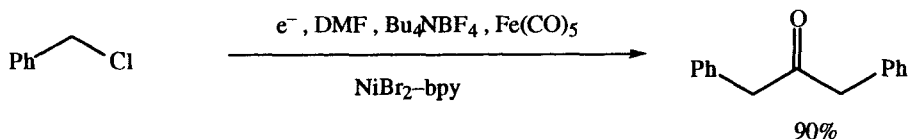
Hanzawa, Y.; Tabuchi, N.; Taguchi, T. *Tetrahedron Lett.*, **1998**, *39*, 6249.



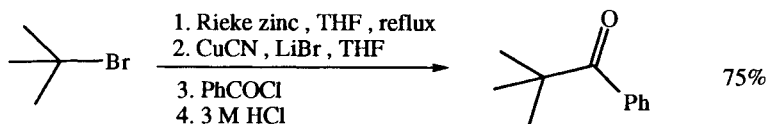
Ogawa, A.; Sumino, Y.; Nanke, T.; Ohya, S.; Sonoda, N.; Hirao, T. *J. Am. Chem. Soc.*, **1997**, *119*, 2745.



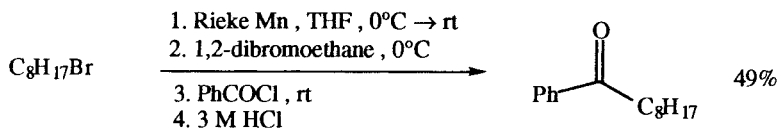
Klement, I.; Stadtmüller, H.; Knochel, P.; Cahiez, G. *Tetrahedron Lett.*, **1997**, *38*, 1927.



Dolhem, E.; Ocafrain, M.; Nédélec, J.Y.; Troupel, M. *Tetrahedron*, **1997**, *53*, 17089.



Kang, S.-K.; Lee, H.-W.; Jang, S.-B.; Kim, T.-H.; Pyun, S.-J.  
*J. Org. Chem.*, **1996**, 61, 2604.



Kim, S.-H.; Hanson, M.V.; Rieke, R.D. *Tetrahedron Lett.*, **1996**, 37, 2197.

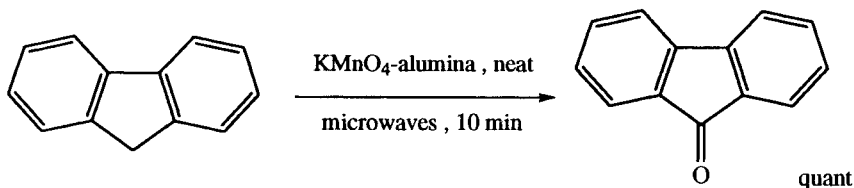
Related Methods:

Section 177 (Ketones from Ketones).

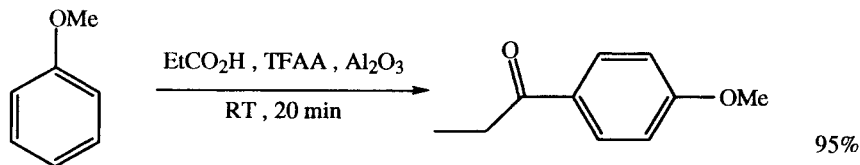
Section 55 (Aldehydes from Halides).

## SECTION 176: KETONES FROM HYDRIDES

This section lists examples of the replacement of hydrogen by ketonic groups,  $\text{R-H} \rightarrow \text{R(C=O)-R'}$ . For the oxidation of methylenes,  $\text{R}_2\text{CH}_2 \rightarrow \text{R}_2\text{C=O}$ , see section 170 (Ketones from Alkyls).



Oussaid, A.; Loupy, A. *J. Chem. Res. (S)*, **1997**, 342.



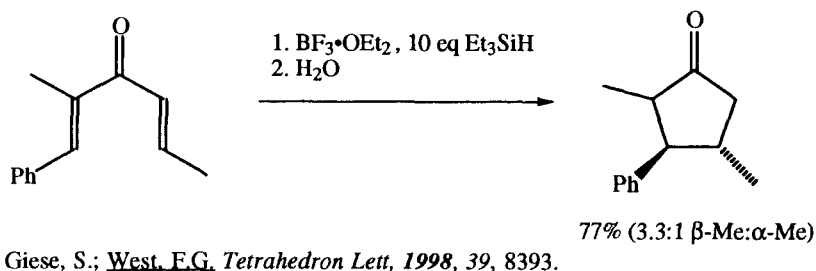
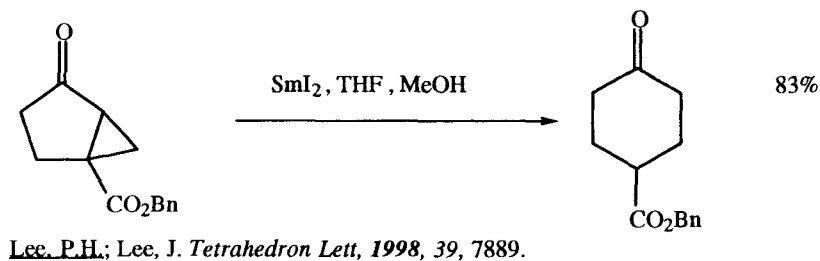
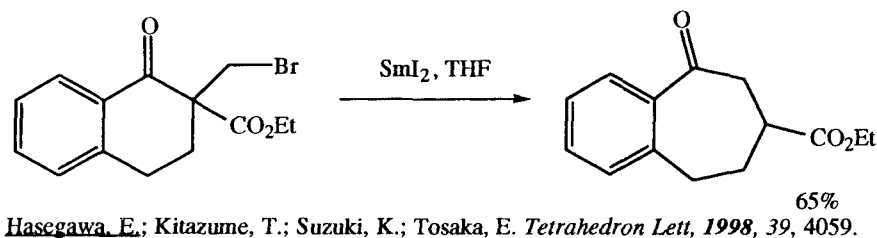
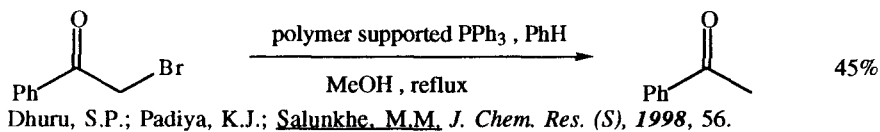
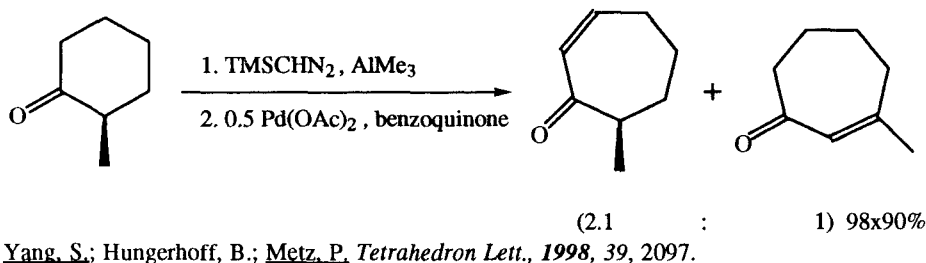
Ranu, B.C.; Ghosh, K.; Jana, U. *J. Org. Chem.*, **1996**, 61, 9546.

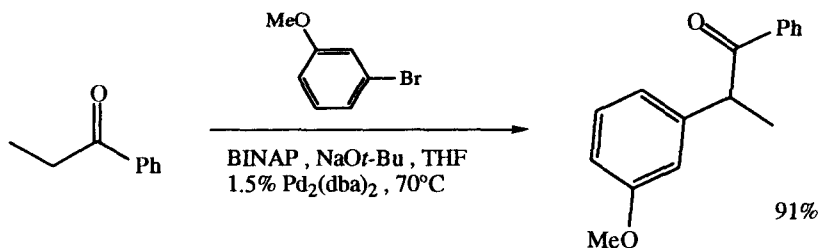
## SECTION 177: KETONES FROM KETONES

This section contains alkylations of ketones and protected ketones, ketone transpositions and annulations, ring expansions and ring openings and dimerizations. Conjugate reductions and Michael alkylations of enone are listed in Section 74 (Alkyls from Alkenes).

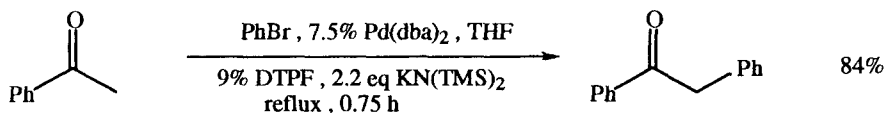


For the preparation of enamines or imines from ketones, see Section 356 (Amine-Alkene)



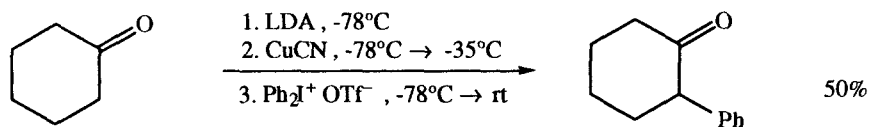


Palucki, M.; Buchwald, S.L. *J. Am. Chem. Soc.*, **1997**, *119*, 11108.

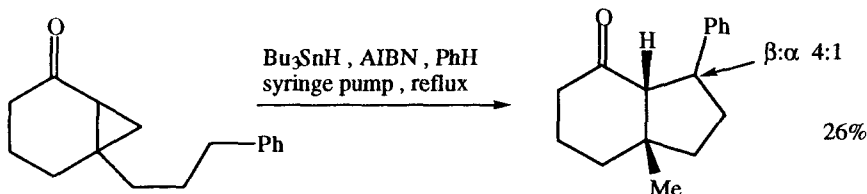


DTPF = 1,1'-bis(di-*o*-tolylphosphino)ferrocene

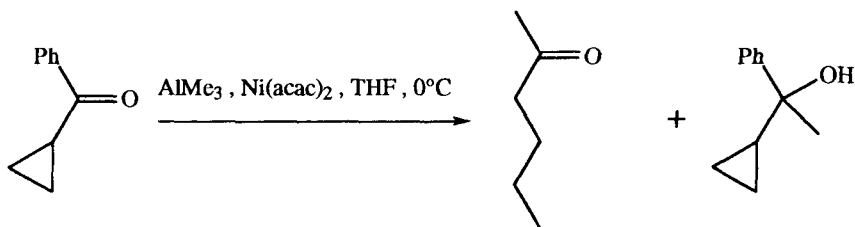
Hamann, B.C.; Hartwig, J.E. *J. Am. Chem. Soc.*, **1997**, *119*, 12382.



Ryan, J.H.; Stang, P.J. *Tetrahedron Lett.*, **1997**, *38*, 5061.



Chambournier, G.; Krishnamurthy, V.; Rawal, V.H. *Tetrahedron Lett.*, **1997**, *38*, 6313.



with MeLi rather than AlMe<sub>3</sub>

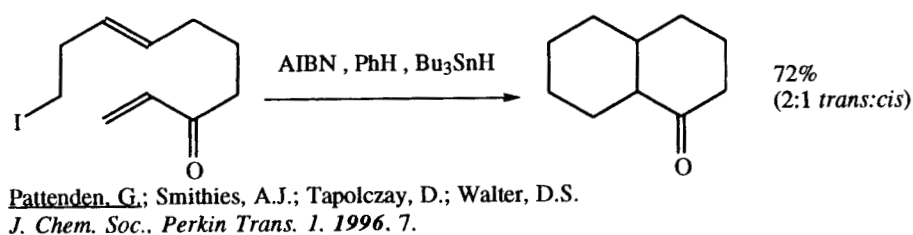
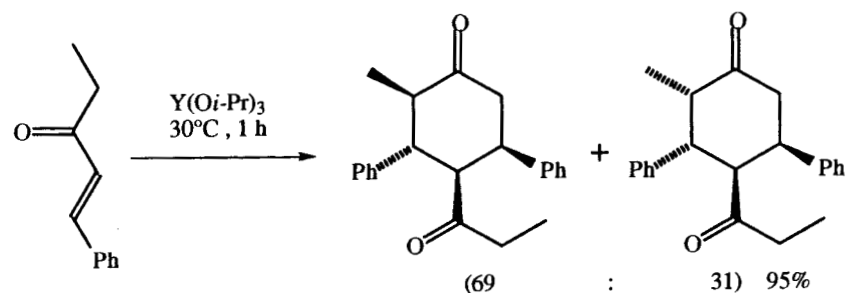
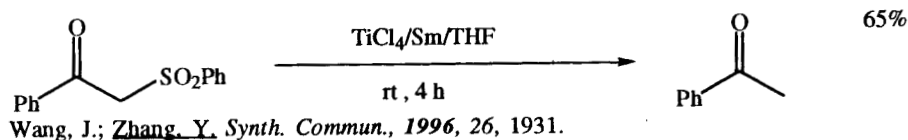
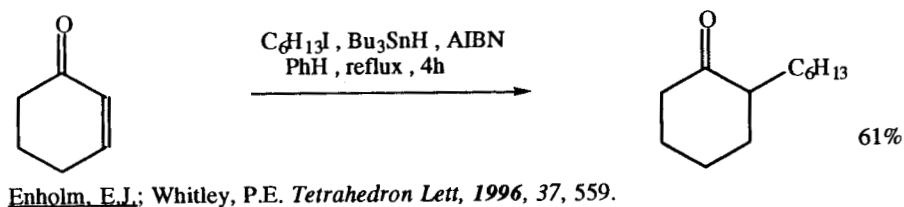
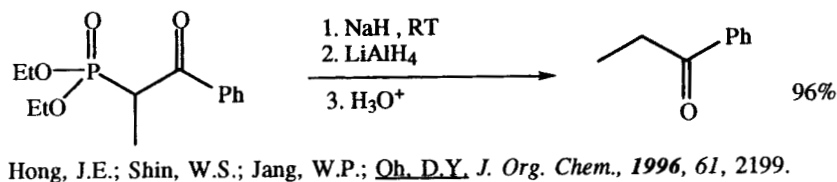
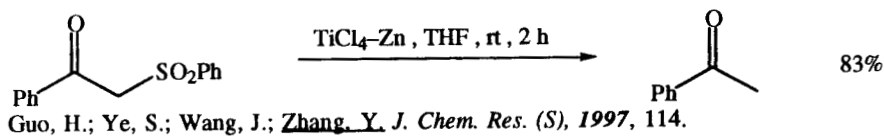
76%

0%

0%

99%

Ichiyang, T.; Kuniyama, S.; Shimizu, M.; Fujisawa, T. *Chem. Lett.*, **1997**, 1149.



**REVIEW:**

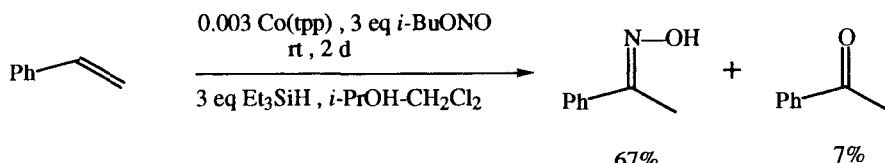
"Conversion of the Thiocarbonyl Group Into the Carbonyl Group."

Corsaro, A.; Pistarà, V. *Tetrahedron*, **1998**, *54*, 15027.

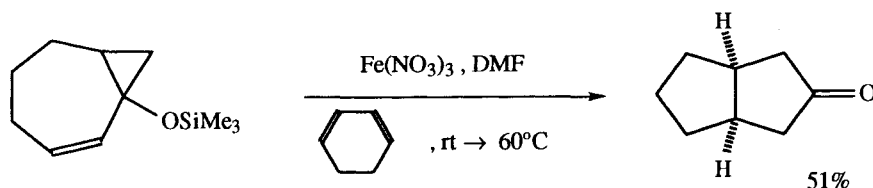
Related Methods: Section 49 (Aldehydes from Aldehydes).

**SECTION 178: KETONES FROM NITRILES**

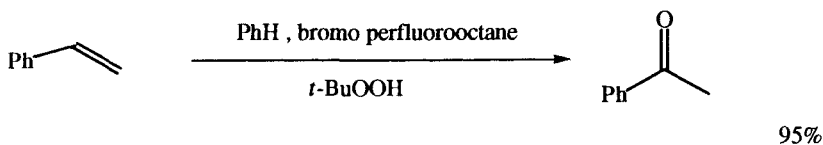
NO ADDITIONAL EXAMPLES

**SECTION 179: KETONES FROM ALKENES**

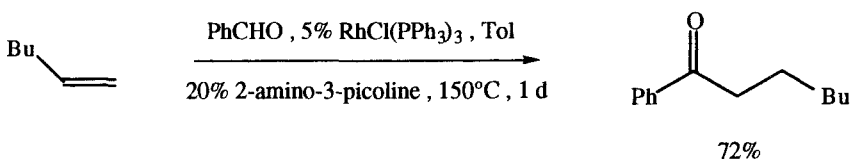
Sugamoto, K.; Hamasuna, Y.; Matsushita, Y.-i. *SynLett*, **1998**, 1270.



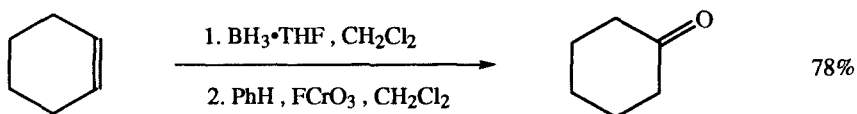
Booker-Milburn, K.L.; Dainty, R.F. *Tetrahedron Lett.*, **1998**, *39*, 5097.



Betzemeier, B.; Lhermitte, F.; Knochel, P. *Tetrahedron Lett.*, **1998**, *39*, 6667.



Jun, C.-H.; Lee, H.; Hong, J.-B. *J. Org. Chem.*, **1997**, *62*, 1200.



Parish, E.L.; Kizito, S.A.; Sun, H. *J. Chem. Res. (S)*, 1997, 64.

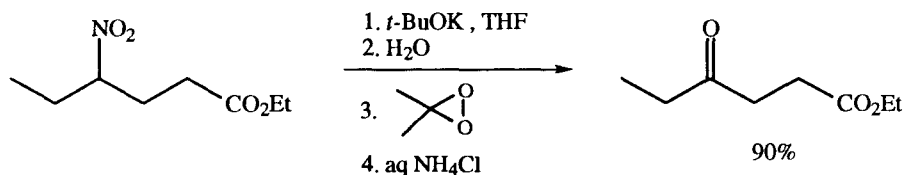
See also:

Section 134 (Ethers from Alkenes).

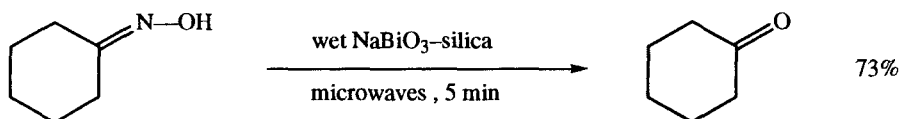
Section 174 (Ketones from Ethers).

## SECTION 180: KETONES FROM MISCELLANEOUS COMPOUNDS

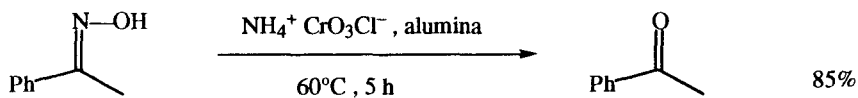
Conjugate reductions and reductive alkylations of enones are listed in Section 74 (Alkyls from Alkenes).



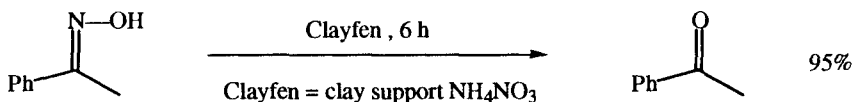
Adam, W.; Makosza, M.; Saha-Möller, C.R.; Zhao, C.-G. *SynLett*, 1998, 1335.



Mitra, A.K.; De, A.; Karchaudhuri, N. *SynLett*, 1998, 1345.

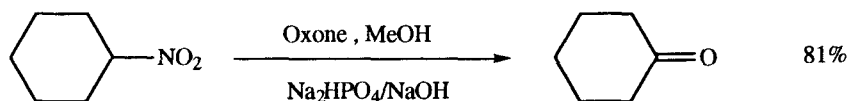


Zhang, G.-S.; Yang, D.-H.; Chen, M.-F.; Cai, K. *Synth. Commun.*, 1998, 28, 2221.

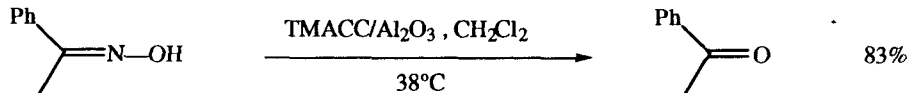
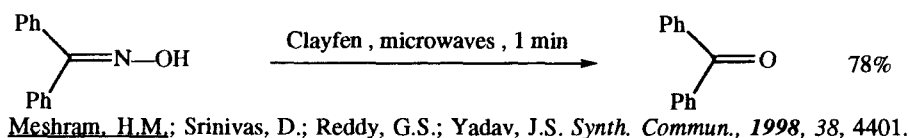
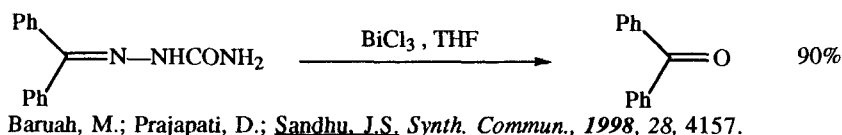
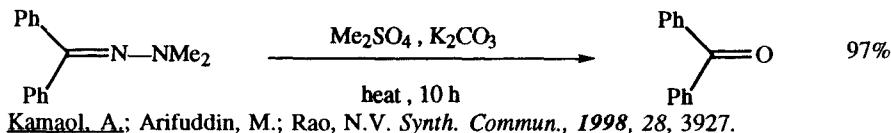
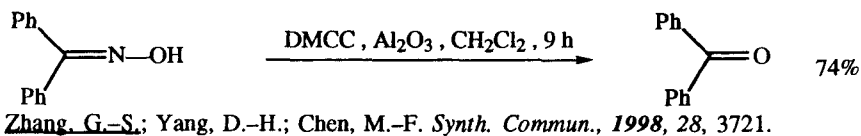


Clayfen = clay support  $\text{NH}_4\text{NO}_3$

Meshram, H.M.; Reddy, G.S.; Srinivas, D.; Yadav, L.S. *Synth. Commun.*, 1998, 28, 2593.

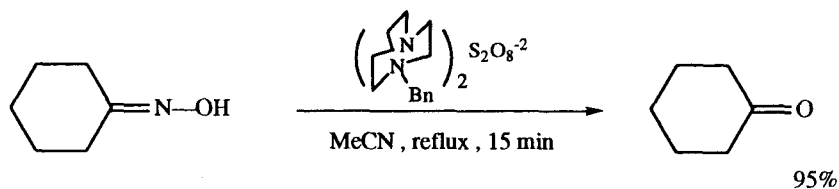


Ceccherelli, P.; Curini, M.; Marcotullio, M.C.; Epifano, F.; Rosati, O. *Synth. Commun.*, 1998, 28, 3057.

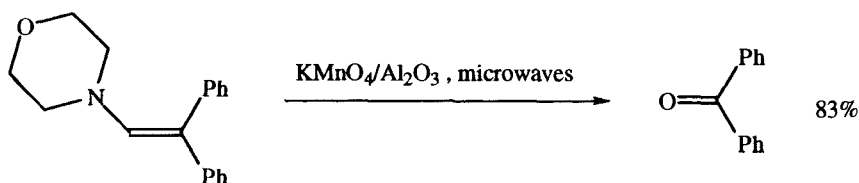


TMACC =  $\text{Me}_3\text{NH}^+ \text{CrO}_3\text{Cl}^-$

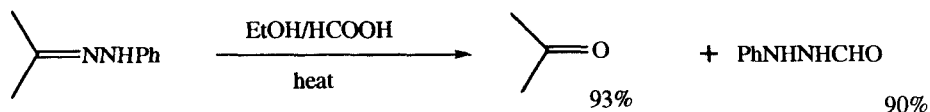
Zhang, G.-S.; Yang, D.-H.; Chen, M.-F. *Org. Prep. Proceed. Int.*, **1998**, 30I, 713.



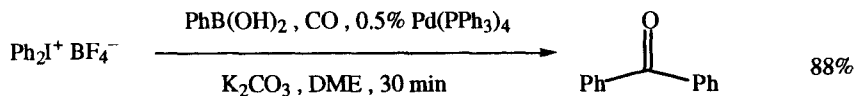
Hajipour, A.R.; Mohammadpoor-Baltork, I.; Kianfar, G. *Bull. Chem. Soc. Jpn.*, **1998**, 71, 2655.



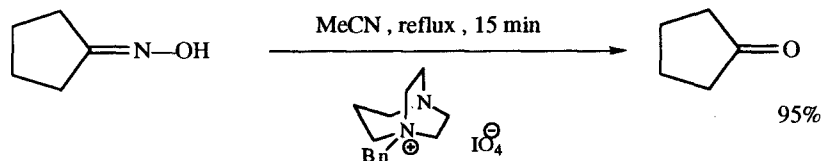
Benhaliliba, H.; Derdour, A.; Bazureau, J.-P.; Texier-Boullet, T.; Hamelin, J. *Tetrahedron Lett.*, **1998**, 39, 541.



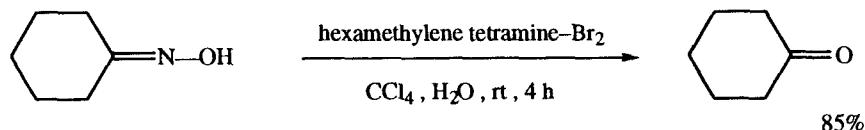
Chakrabarty, M.; Khasnobis, S. *Synth. Commun.*, 1998, 28, 1361.



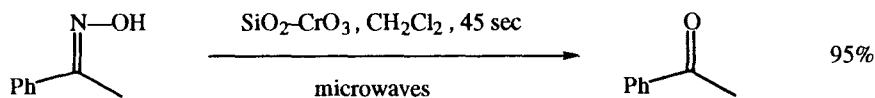
**Kang, S.-K.**; Lim, K.-H.; Ho, P.-S.; Yoon, S.-K.; Son, H.-J.  
*Synth. Commun.*, 1998, 28, 1481.



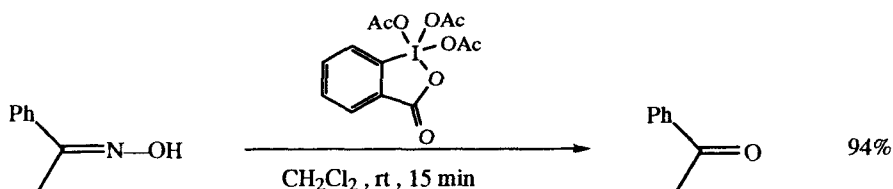
Hajipour, A.R.; Mahboubghah, N. *J. Chem. Res. (S)*, 1998, 122.



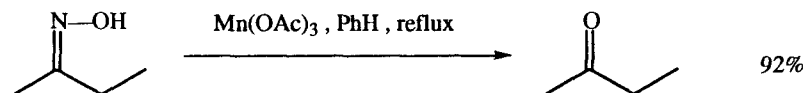
Bandgar, B.P.; Admane, S.B.; Jare, S.S. *J. Chem. Soc. (S)*, 1998, 154.



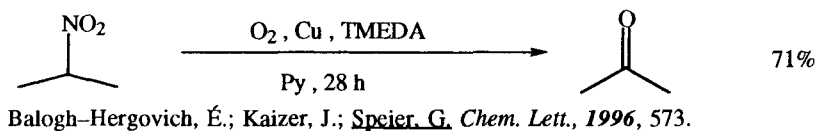
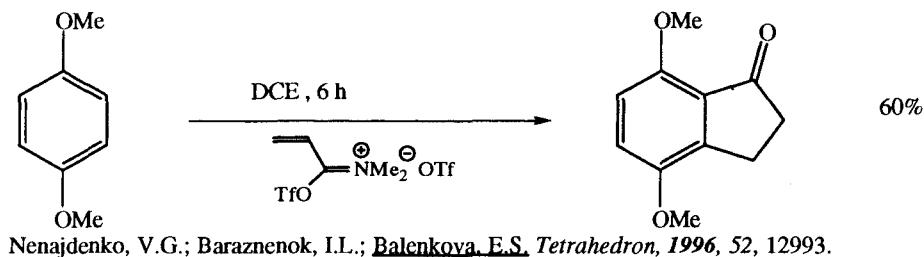
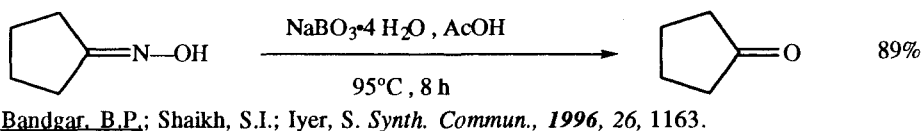
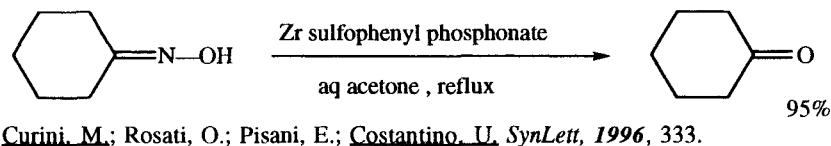
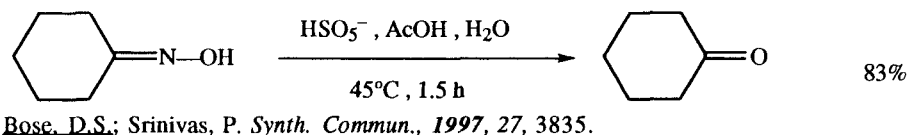
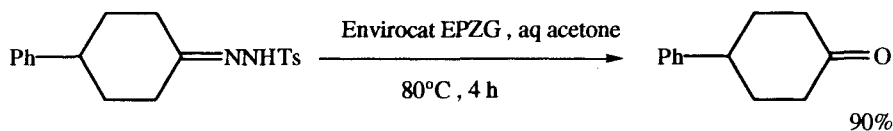
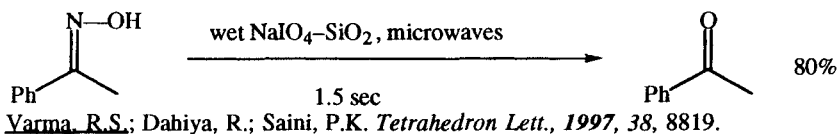
Bendale, P.M.; Khadilkar, B.M. *Tetrahedron Lett.*, **1998**, *39*, 5867.



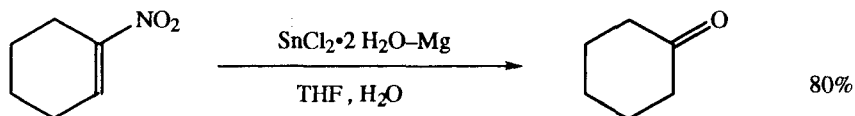
Chaudhari, S.S.; Akamanchi, K.G. *Tetrahedron Lett.*, **1998**, 39, 3209.



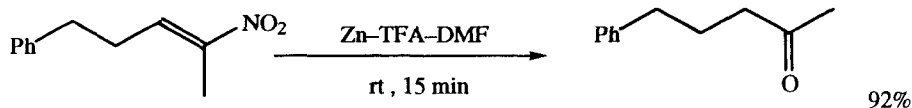
Demir, A.S.; Tanyeli, C.; Altinel, E. *Tetrahedron Lett.*, 1997, 38, 7267.



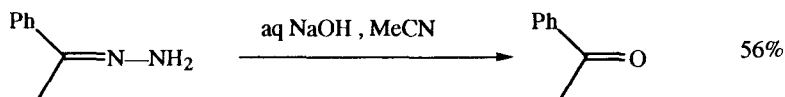




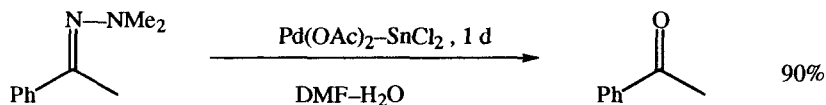
Das, N.B.; Sarangi, C.; Nanda, B.; Nayak, A.; Sharma, R.P. *J. Chem. Res (S)*, **1996**, 28.



Saikia, A.K.; Barua, N.C.; Sharma, R.P.; Ghosh, A.C. *J. Chem. Res. (S)*, **1996**, 124.



Khurana, J.M.; Singh, S.; Panda, A.K. *J. Chem. Res. (S)*, **1996**, 532.



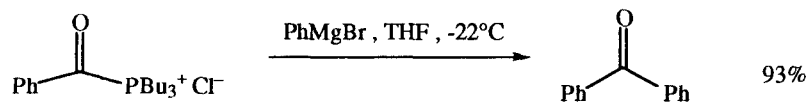
Mino, T.; Hirota, T.; Yamashita, M. *SynLett*, **1996**, 999.

#### REVIEW:

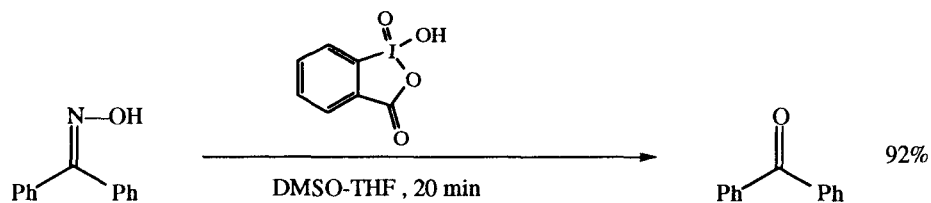
"Aldehydes and Ketones."

Lawrence, N.J. *J. Chem. Soc., Perkin Trans. 1*, **1998**, 1739.

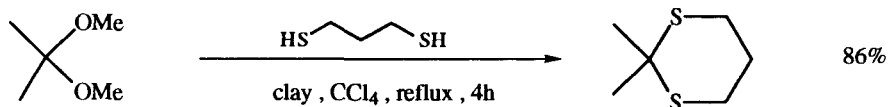
### SECTION 180A: PROTECTION OF KETONES



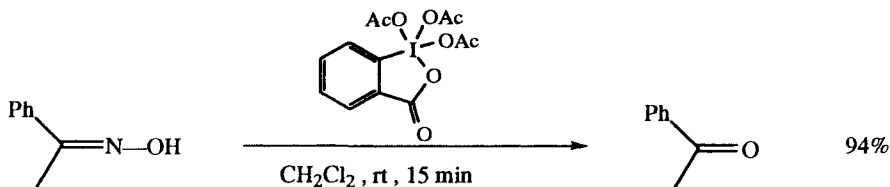
Maeda, H.; Takahashi, K.; Ohmori, H. *Tetrahedron*, **1998**, 54, 12233.



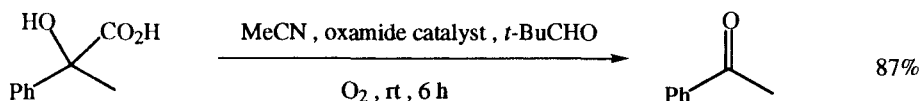
Bose, D.S.; Srinivas, P. *SynLett*, **1998**, 977.



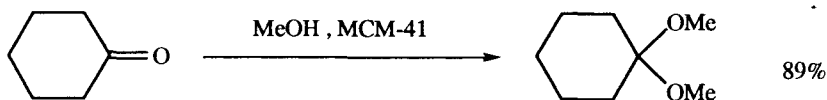
Jnaneshwara, G.K.; Barhate, N.B.; Sudalai, A.; Deshpande, V.H.; Wakharkar, R.D.; Gajare, A.S. Shingare, M.S.; Sukumar, R. *J. Chem. Soc., Perkin Trans. 1*, **1998**, 965.



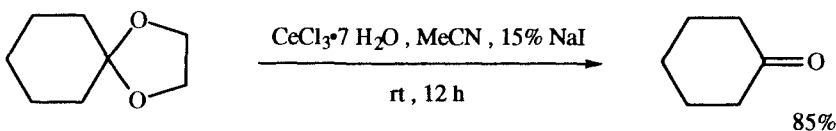
DeVos, D.E.; Sels, B.F.; Reynaers, M.; Subba Rao, Y.V.; Jacobs, P.A. *Tetrahedron Lett.*, **1998**, 39, 3221.



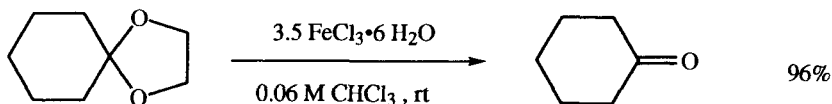
Blay, G.; Fernández, I.; Formentin, P.; Pedro, J.R.; Roselló, A.L.; Ruiz, R.; Journaux, Y. *Tetrahedron Lett.*, **1998**, 39, 3327.



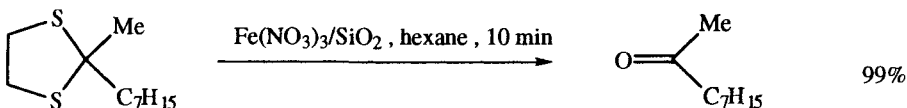
Tanaka, Y.; Sawamura, N.; Iwamoto, M. *Tetrahedron Lett.*, **1998**, 39, 9457.



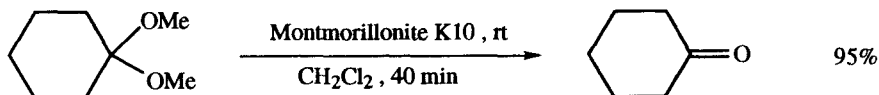
Marcantoni, E.; Nobili, F.; Bartoli, G.; Bosco, M.; Sambri, L. *J. Org. Chem.*, **1997**, 62, 4183.



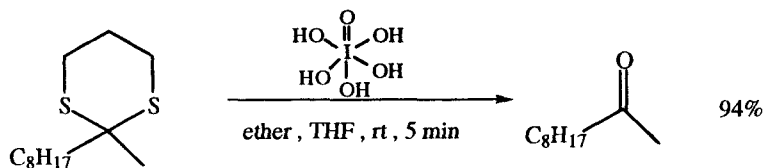
Sen, S.E.; Roach, S.L.; Boggs, J.K.; Ewing, G.J.; Magrath, J. *J. Org. Chem.*, **1997**, 62, 6684



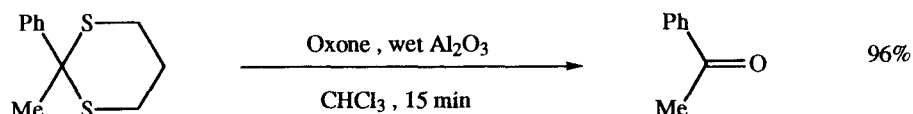
Hirano, M.; Ukawa, K.; Yakabe, S.; Morimoto, T. *Org. Prep. Proceed. Int.*, **1997**, 29, 480.



Gautier, E.C.L.; Graham, A.E.; McKillop, A.; Standen, S.P.; Taylor, R.J.K. *Tetrahedron Lett.*, **1997**, 38, 1881.



Shi, X.-X.; Khanapure, S.P.; Rokach, J. *Tetrahedron Lett.*, **1996**, 37, 4331.



Ceccherelli, P.; Curini, M.; Marcotullio, M.C.; Epifano, F.; Rosati, O. *SynLett*, **1996**, 767.

See Section 362 (Ester-Alkene) for the formation of enol esters and Section 367 (Ether-Alkenes) for the formation of enol ethers. Many of the methods in Section 60A (Protection of Aldehydes) are also applicable to ketones.

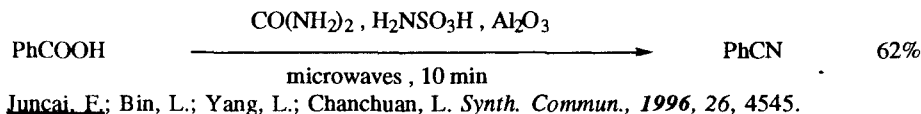
## CHAPTER 13

### PREPARATION OF NITRILES

#### SECTION 181: NITRILES FROM ALKYNES

NO ADDITIONAL EXAMPLES

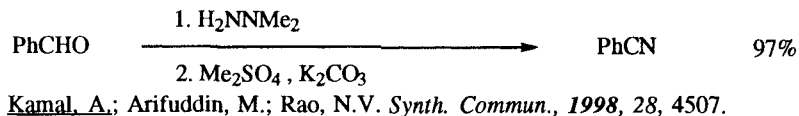
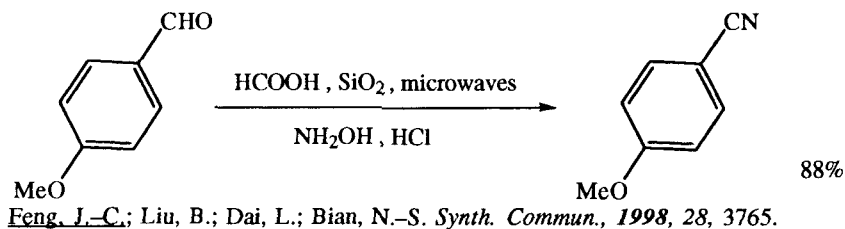
#### SECTION 182: NITRILES FROM ACID DERIVATIVES

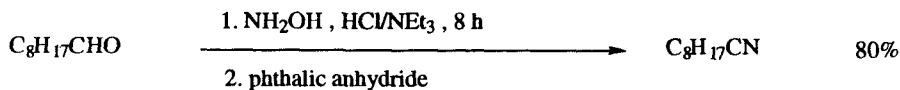


#### SECTION 183: NITRILES FROM ALCOHOLS AND THIOLS

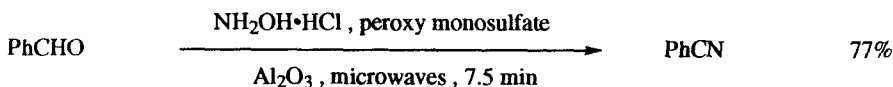
NO ADDITIONAL EXAMPLES

#### SECTION 184: NITRILES FROM ALDEHYDES





Wang, E.-C.; Lin, G.-J. *Tetrahedron Lett.*, **1998**, 39, 4047.

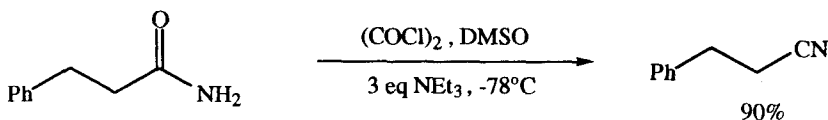


Bose, D.S.; Narsaiah, A.V. *Tetrahedron Lett.*, **1998**, 39, 6533.

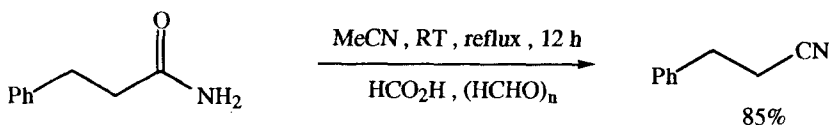
## SECTION 185: NITRILES FROM ALKYL, METHYLENES AND ARYL

NO ADDITIONAL EXAMPLES

## SECTION 186: NITRILES FROM AMIDES

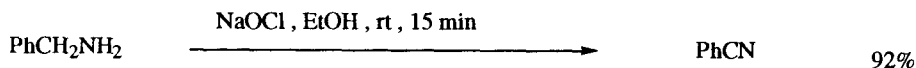


Nakajima, N.; Ubukata, M. *Tetrahedron Lett.*, **1997**, 38, 2099.



Heck, M.-P.; Wagner, A.; Mioskowski, C. *J. Org. Chem.*, **1996**, 61, 6406.

## SECTION 187: NITRILES FROM AMINES



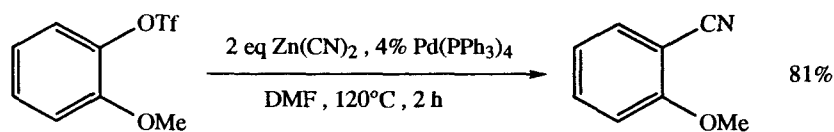
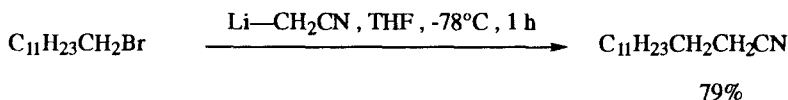
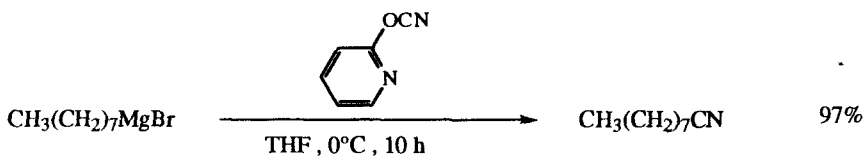
Yamazaki, S. *Synth. Commun.*, **1997**, 27, 3559.

## SECTION 188: NITRILES FROM ESTERS

NO ADDITIONAL EXAMPLES

**SECTION 189: NITRILES FROM ETHERS, EPOXIDES AND THIOETHERS**

NO ADDITIONAL EXAMPLES

**SECTION 190: NITRILES FROM HALIDES AND SULFONATES**Kubota, H.; Rice, K.C. *Tetrahedron Lett.*, **1998**, 39, 2907.Taber, D.E.; Kong, S. *J. Org. Chem.*, **1997**, 62, 8575.Koo, J.S.; Lee, J.I. *Synth. Commun.*, **1996**, 26, 3601.**SECTION 191: NITRILES FROM HYDRIDES**

NO ADDITIONAL EXAMPLES

**SECTION 192: NITRILES FROM KETONES**

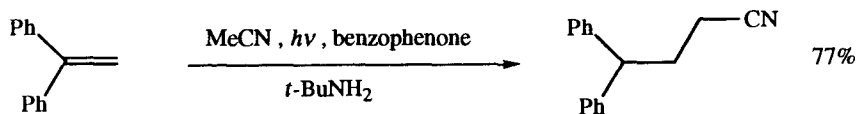
NO ADDITIONAL EXAMPLES

**SECTION 193: NITRILES FROM NITRILES**

Conjugate reductions and Michael alkylations of alkene nitriles are found in Section 74D (Alkyls from Alkenes).

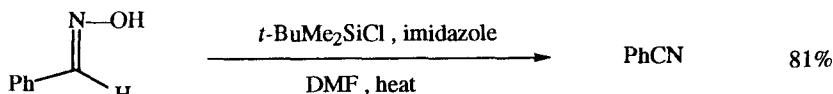
NO ADDITIONAL EXAMPLES

## SECTION 194: NITRILES FROM ALKENES

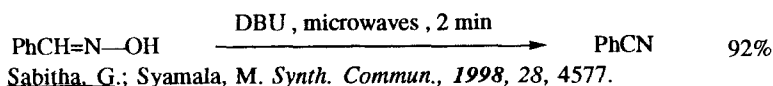


Yamashita, T.; Yasuda, M.; Watanabe, M.; Kojima, R.; Tanabe, K.; Shima, K.  
*J. Org. Chem.*, **1996**, 61, 6438.

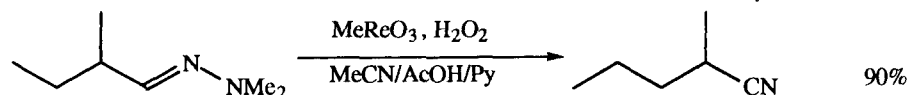
## SECTION 195: NITRILES FROM MISCELLANEOUS COMPOUNDS



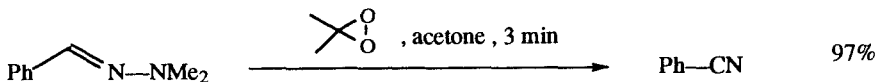
Ortiz-Marciales, M.; Piñero, L.; Ufret, L.; Algarín, W.; Morales, J.  
*Synth. Commun.*, **1998**, 28, 2807.



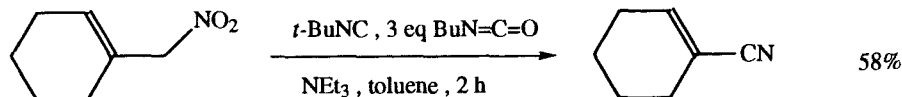
Sabitha, G.; Syamala, M. *Synth. Commun.*, **1998**, 28, 4577.



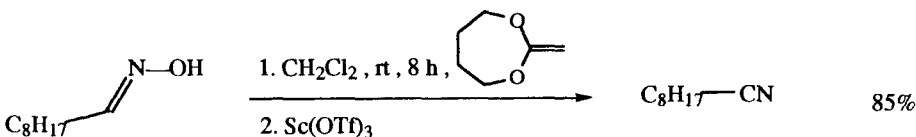
Stanković, S.; Espenson, J.H. *Chem. Commun.*, **1998**, 1579.



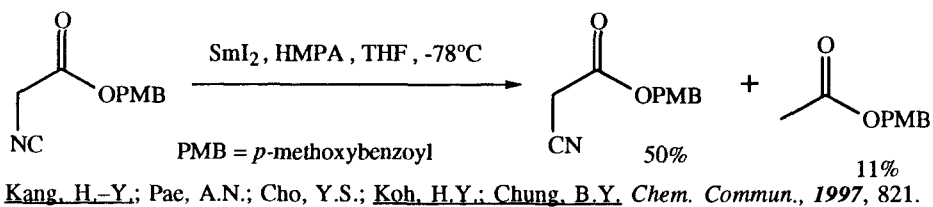
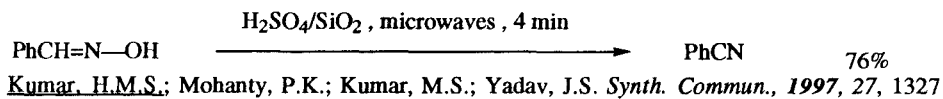
Altamura, A.; D'Accolti, L.; Detomaso, A.; Dinoi, A.; Fiorentino, M.; Fusco, C.; Curci, R.  
*Synth. Commun.*, **1998**, 39, 2009.



El Kaim, L.; Gacon, A. *Tetrahedron Lett.*, **1997**, 38, 3391.



Fukuzama, S.; Yamaishi, Y.; Furuya, H.; Terao, K.; Iwasaki, F.  
*Tetrahedron Lett.*, **1997**, 38, 7203.

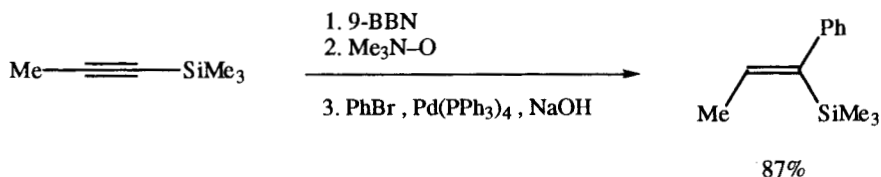




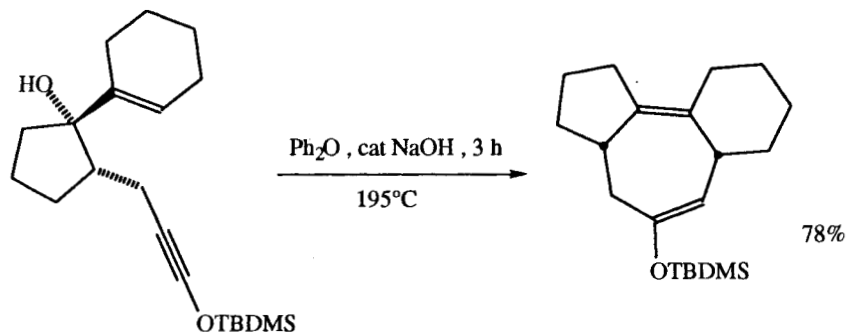
## CHAPTER 14

# PREPARATION OF ALKENES

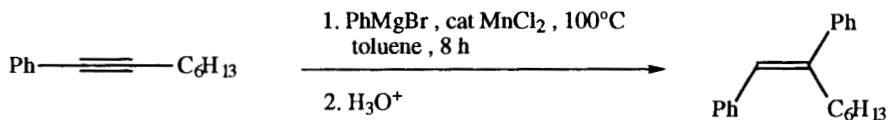
### SECTION 196: ALKENES FROM ALKYNES



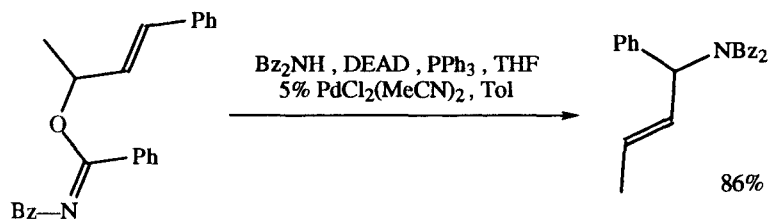
Soderquist, J.A.; León, G. *Tetrahedron Lett.*, **1998**, 39, 3989.



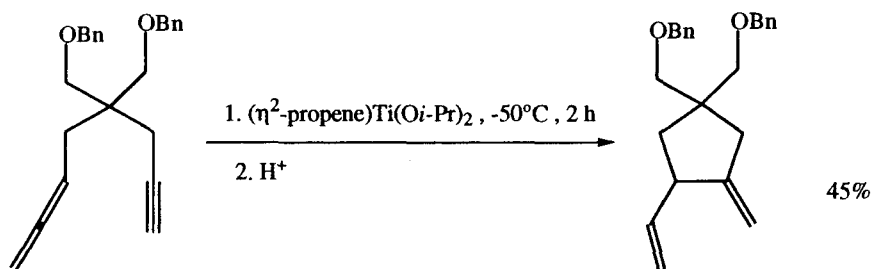
Oyaska, T.V.; Roark, J.L.; Shoemaker, C.M.; Bordner, J. *Tetrahedron Lett.*, **1998**, 39, 5705



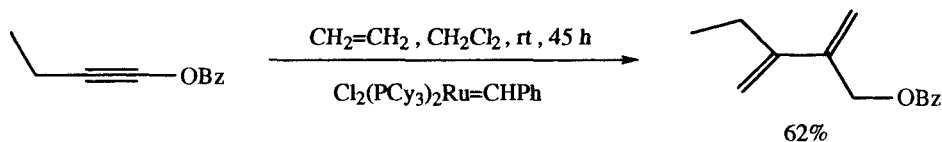
Yorimitsu, H.; Tang, J.; Okada, K.; Shinokubo, H.; Oshima, K. *Chem. Lett.*, **1998**, 11, 66%



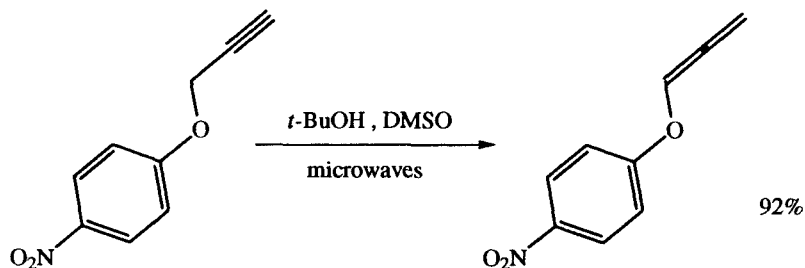
Fujiwara, N.; Yamamoto, Y. *J. Org. Chem.*, **1997**, 62, 2318.



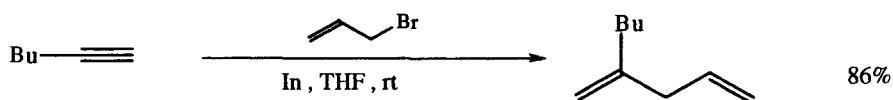
Urabe, H.; Takeda, T.; Hideura, D.; Sato, E. *J. Am. Chem. Soc.*, **1997**, 119, 11295.



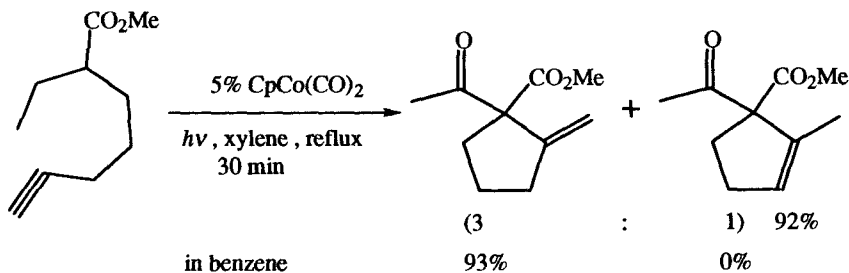
Kinoshita, A.; Sakakibara, N.; Mori, M. *J. Am. Chem. Soc.*, **1997**, 119, 12388.



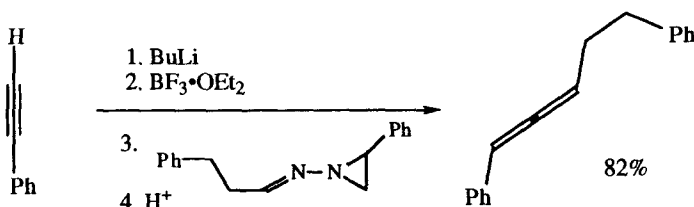
Moghaddam, F.M.; Emami, R. *Synth. Commun.*, **1997**, 27, 4073.



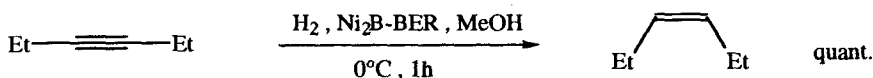
Ranu, B.C.; Majee, A. *Chem. Commun.*, **1997**, 1225.



Cruciani, P.; Stammer, R.; Aubert, C.; Malacria, M. *J. Org. Chem.*, **1996**, 61, 2699.

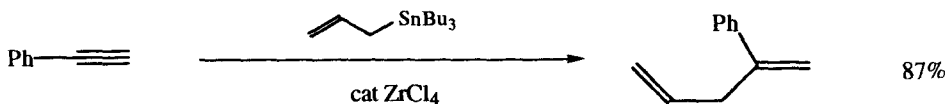


Kim, S.; Cho, C.M.; Yoon, Y.-Y. *J. Org. Chem.*, **1996**, 61, 6018.



BER = borohydride exchange resin

Choi, J.; Yoon, N.M. *Tetrahedron Lett.*, **1996**, 37, 1057.

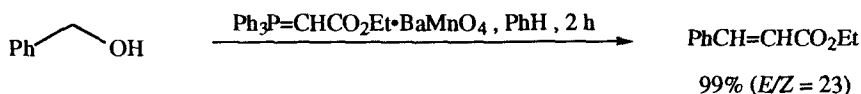


Asao, N.; Matsukawa, Y.; Yamamoto, Y. *Chem. Commun.*, **1996**, 1513.

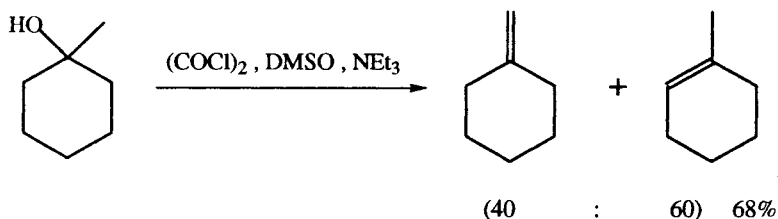
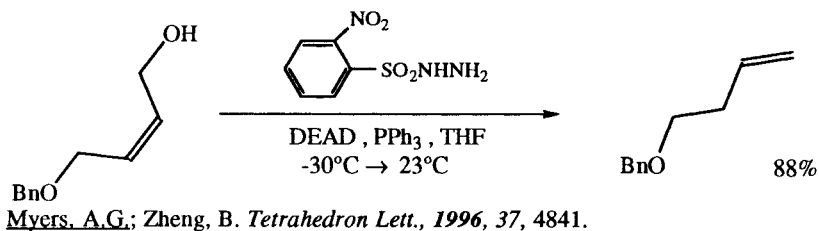
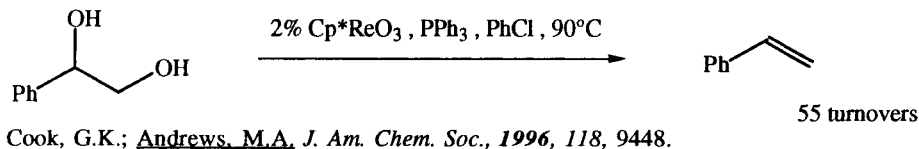
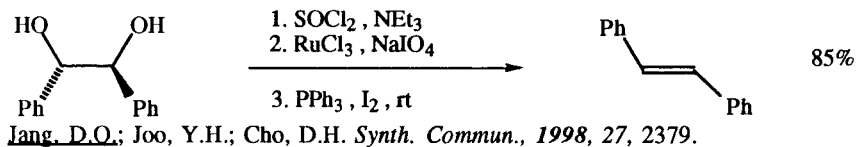
## SECTION 197: ALKENES FROM ACID DERIVATIVES

NO ADDITIONAL EXAMPLES

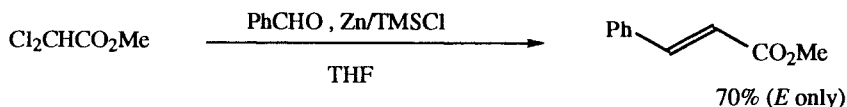
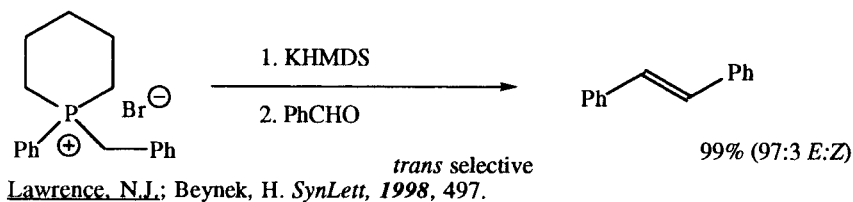
## SECTION 198: ALKENES FROM ALCOHOLS AND THIOLS



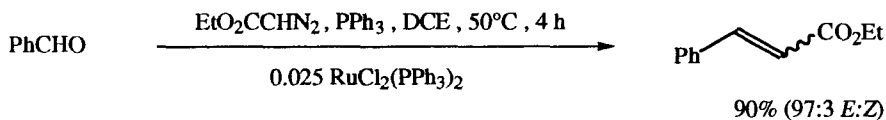
Shuto, S.; Niizuma, S.; Matsuda, A. *J. Org. Chem.*, **1998**, 63, 4489.



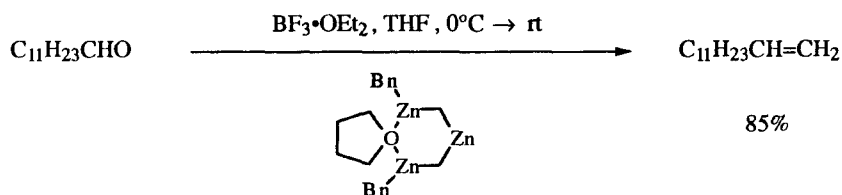
## SECTION 199: ALKENES FROM ALDEHYDES



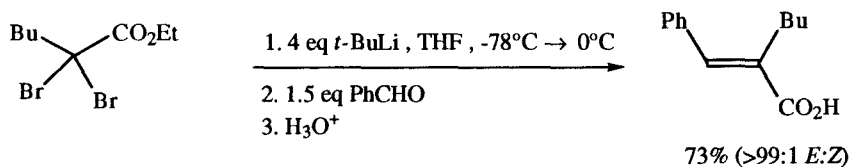
Ishino, Y.; Mihara, M.; Nishihama, S.; Nishiguchi, I. *Bull. Chem. Soc. Jpn.*, **1998**, 71, 2669



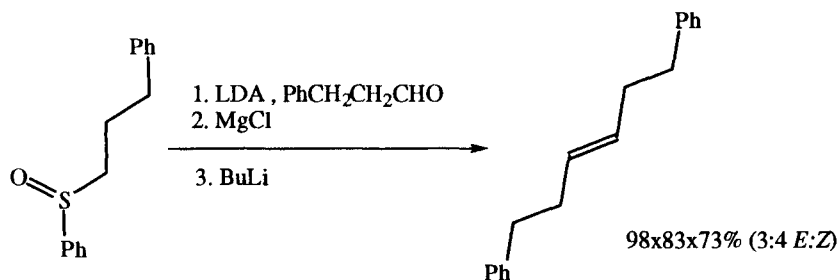
Fujimura, O.; Honma, T. *Tetrahedron Lett*, 1998, 39, 625.



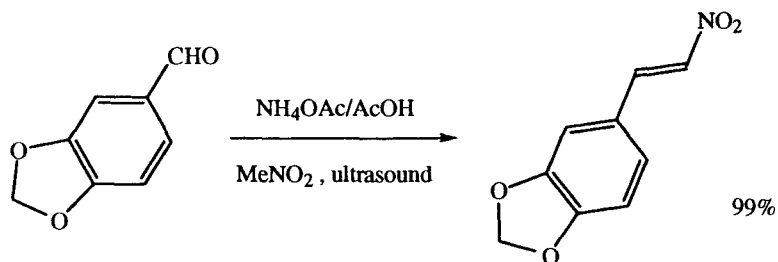
**Matsubara, S.; Sugihara, M.; Utimoto, K. *SynLett*, 1998, 313.**



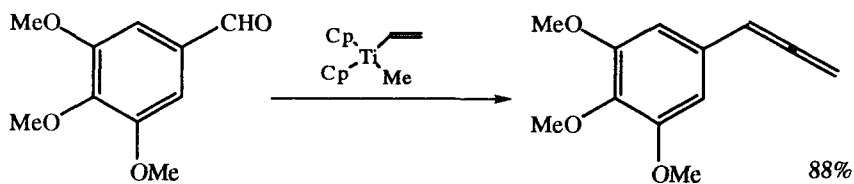
Shindo, M.; Sato, Y.; Shishido, K. *Tetrahedron Lett.*, **1998**, 39, 4857.



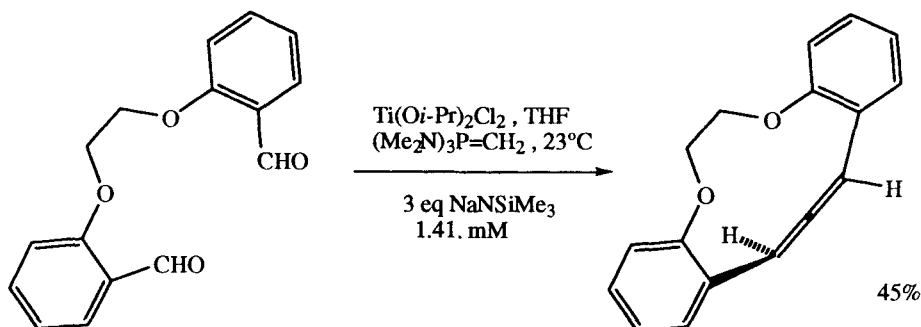
Sato, T.; Yamada, N.; Asano, T. *Tetrahedron Lett*, **1998**, 39, 6935.



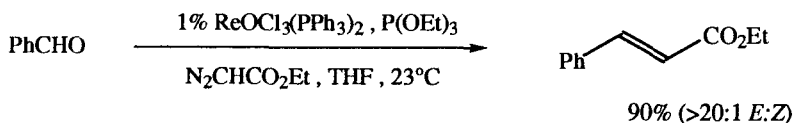
McNulty, J.; Steere, J.A.; Wolf, S. *Tetrahedron Lett.*, 1998, 39, 8013.



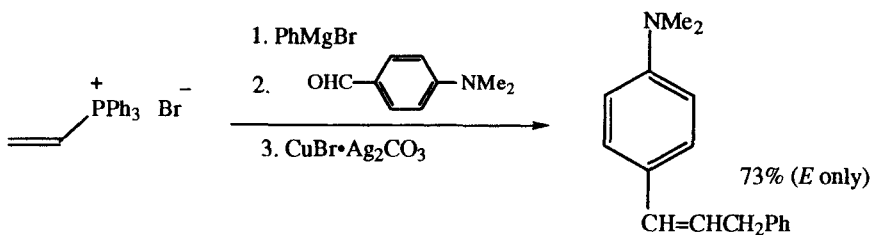
Petasis, N.A.; Hu, Y.-H. *J. Org. Chem.*, **1997**, 62, 782.



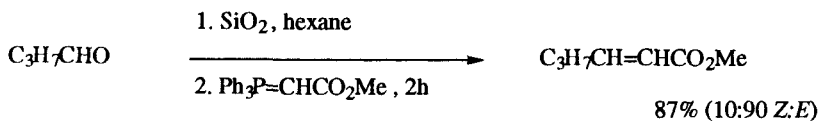
Brody, M.S.; Williams, R.M.; Finn, M.G. *J. Am. Chem. Soc.*, **1997**, 119, 3429.



Ledford, B.E.; Carreira, E.M. *Tetrahedron Lett.*, **1997**, 38, 8125.

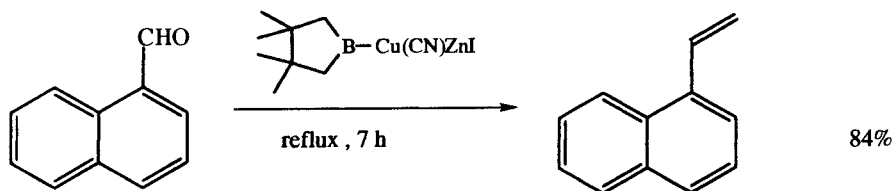


Shen, Y.; Yao, J. *J. Org. Chem.*, **1996**, 61, 8659.

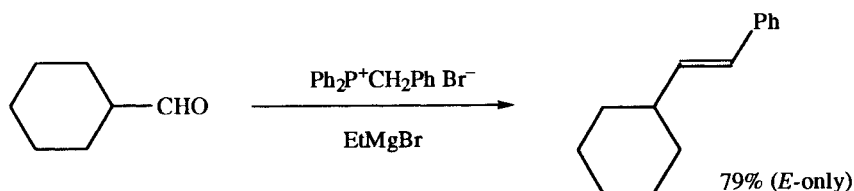


reaction time was 42 h without silica gel

Patil, V.J.; Mävers, U. *Tetrahedron Lett.*, **1996**, 37, 1281.



Sakai, M.; Saito, S.; Kanai, G.; Suzuki, A.; Miyaura, N. *Tetrahedron*, **1996**, 52, 915.



Shen, Y.; Yao, J. *J. Chem. Res. (S)*, **1996**, 394.

Related Methods: Section 207 (Alkenes from Ketones).

## SECTION 200: ALKENES FROM ALKYLs, METHYLENES AND ARYLs

This section contains dehydrogenations to form alkenes and unsaturated ketones, esters and amides. It also includes the conversion of aromatic rings to alkenes. Reduction of aryls to dienes is found in Section 377 (Alkene-Alkene). Hydrogenation of aryls to alkanes and dehydrogenations to form aryls are included in Section 74 (Alkyls from Alkenes).

NO ADDITIONAL EXAMPLES

## SECTION 201: ALKENES FROM AMIDES

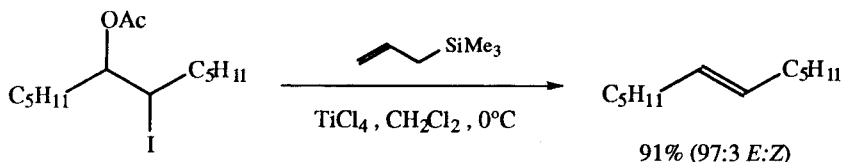
Related Methods:           Section 65 (Alkyls from Alkyls).  
                                   Section 74 (Alkyls from Alkenes).

NO ADDITIONAL EXAMPLES

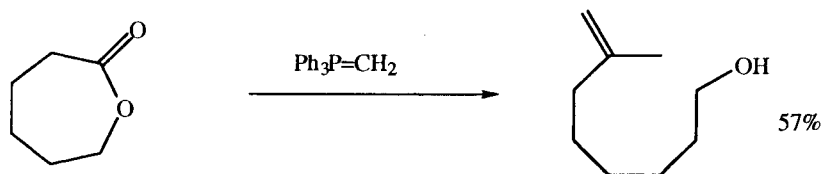
## SECTION 202: ALKENES FROM AMINES

NO ADDITIONAL EXAMPLES

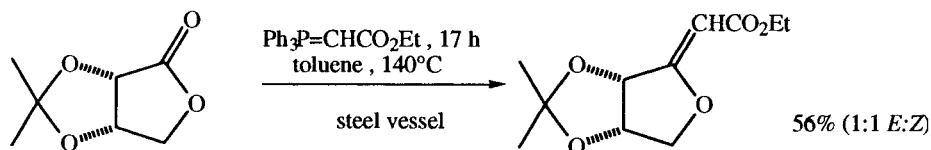
## SECTION 203: ALKENES FROM ESTERS



Yachi, K.; Maeda, K.; Shinokubo, H.; Oshima, K. *Tetrahedron Lett.*, **1997**, 38, 5161.

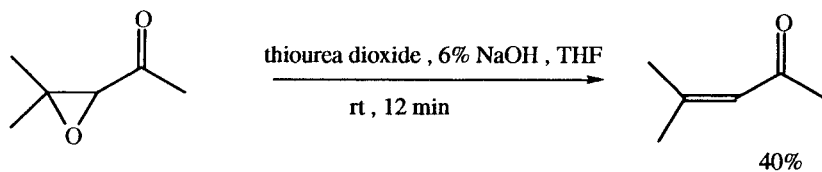


Brunel, Y.; Rousseau, G. *Tetrahedron Lett.*, **1996**, 37, 3853.

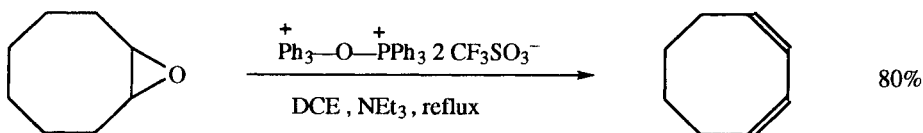


Lakhrissi, M.; Chapleur, Y. *Angew. Chem. Int. Ed.*, **1996**, 35, 750.

## SECTION 204: ALKENES FROM ETHERS, EPOXIDES AND THIOETHERS

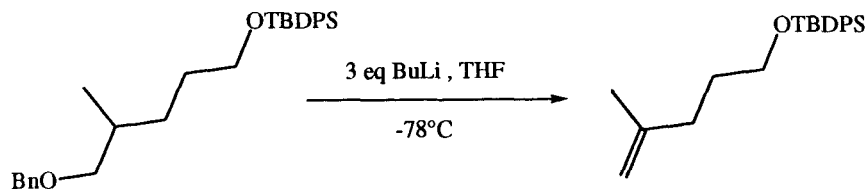


dos Santos, R.B.; Brocksom, T.J.; Brocksom, U. *Tetrahedron Lett.*, **1997**, 38, 745.

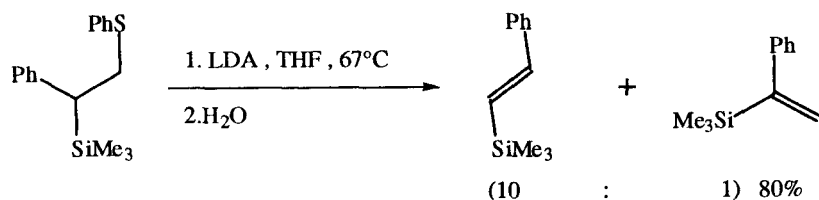


Hendrickson, J.B.; Walker, M.A.; Varvak, A.; Hussoin, Md.S. *SynLett*, **1996**, 661.





Matsushita, M.; Nagaoka, Y.; Hioki, H.; Fukuyama, Y.; Kodama, M. *Chem. Lett.*, **1996**, 1039



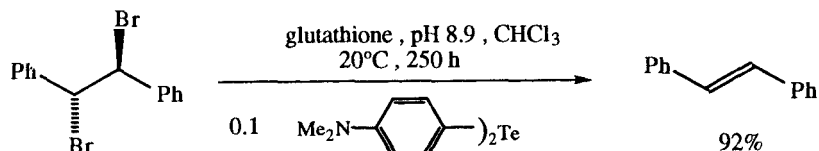
Menichetti, S.; Stirling, C.J.M. *J. Chem. Soc., Perkin Trans. 1*, **1996**, 1511.

#### REVIEW:

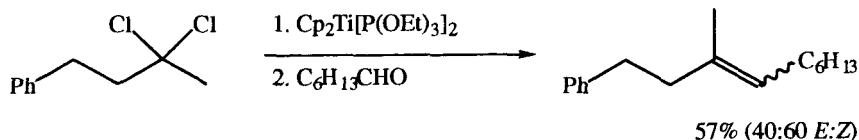
"Recent Advances in the Chemistry of Carbenoids Derived from Epoxides."

Doris, E.; Dechoux, L.; Mioskowski, C. *SynLett*, **1998**, 337.

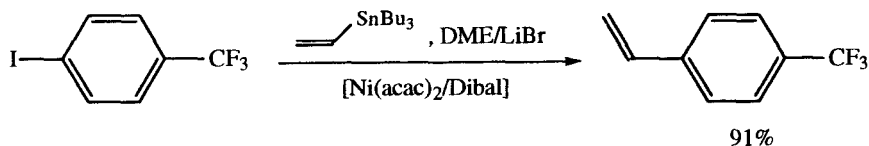
### SECTION 205: ALKENES FROM HALIDES AND SULFONATES



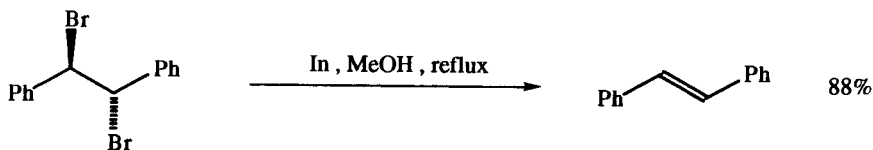
Butcher, T.S.; Dettly, M.R. *J. Org. Chem.*, **1998**, 63, 177.



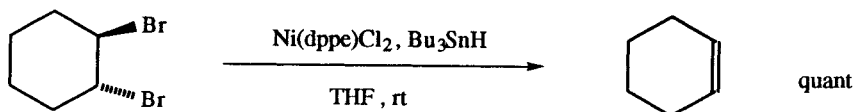
Takeda, T.; Sasaki, R.; Fujiwara, T. *J. Org. Chem.*, **1998**, 63, 7286.



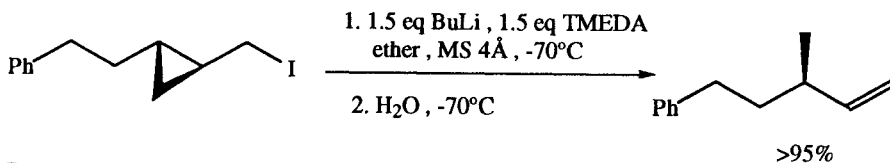
Shirakawa, E.; Yamasaki, K.; Hiyama, T. *Synthesis*, **1998**, 1544.



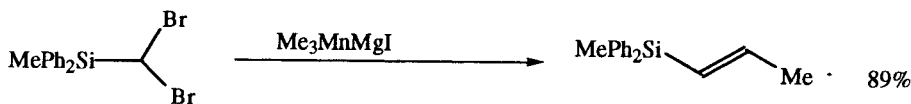
Ranu, B.C.; Guchhait, S.K.; Sarkar, A. *Chem. Commun.*, **1998**, 2113.



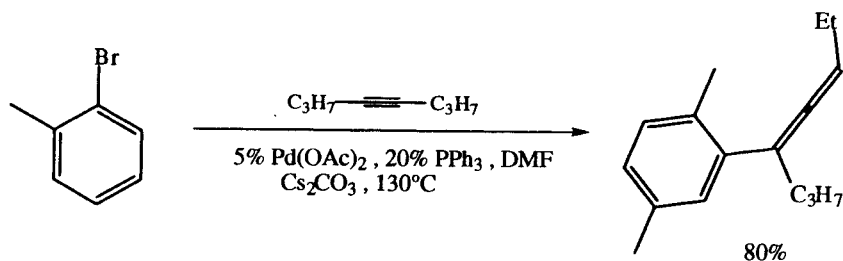
Malanga, C.; Mannucci, S.; Lardicci, L. *Tetrahedron*, **1998**, *54*, 1021.



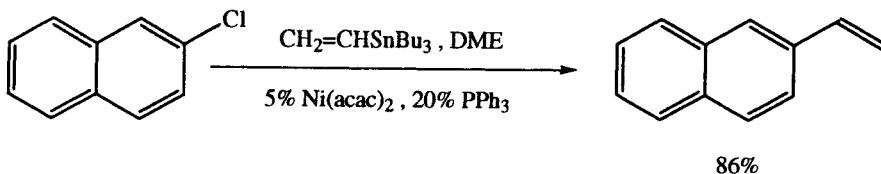
Charette, A.B.; Naud, J. *Tetrahedron Lett.*, **1998**, *39*, 7259.



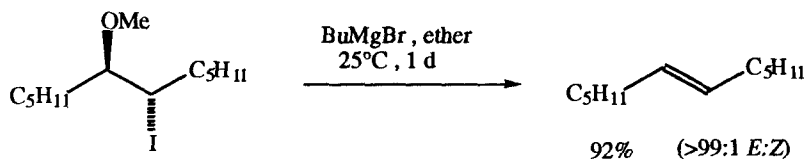
Kakiya, H.; Inoue, R.; Shinokubo, H.; Oshima, K. *Tetrahedron Lett.*, **1997**, *38*, 3275.



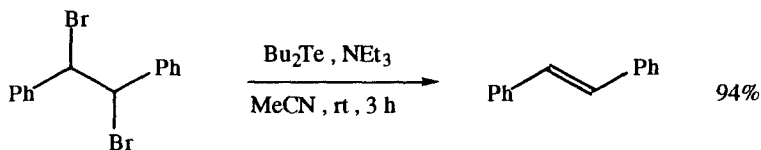
Pivsa-Art, S.; Satoh, T.; Miura, M.; Nomura, M. *Chem. Lett.*, **1997**, 823.



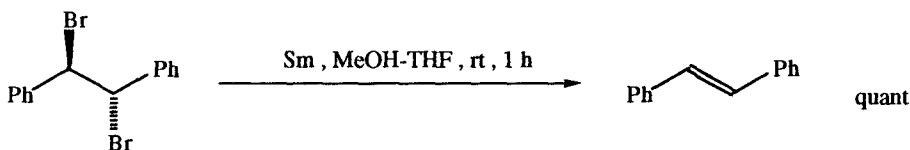
Shirakawa, E.; Yamasaki, K.; Hiyama, T. *J. Chem. Soc., Perkin Trans. I*, **1997**, 2449.



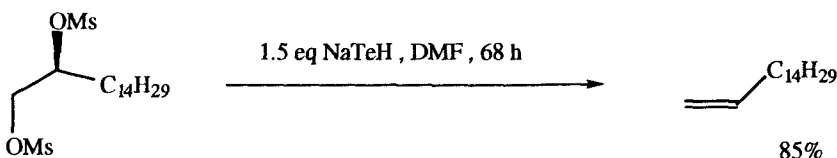
Maeda, K.; Shinokubo, H.; Oshima, K. *J. Org. Chem.*, **1996**, 61, 6770.



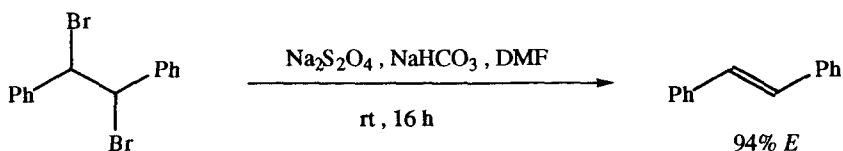
Zheng, M.; Zhang, M.-H.; Shao, J.-G.; Zhong, Q. *Org. Prep. Proceed. Int.*, **1996**, 28, 117.



Yanada, R.; Negoro, N.; Yanada, K.; Fujita, T. *Tetrahedron Lett.*, **1996**, 37, 9313.



Bargues, V.; Blay, G.; Fernández, I.; Pedro, J.R. *SynLett*, **1996**, 655.



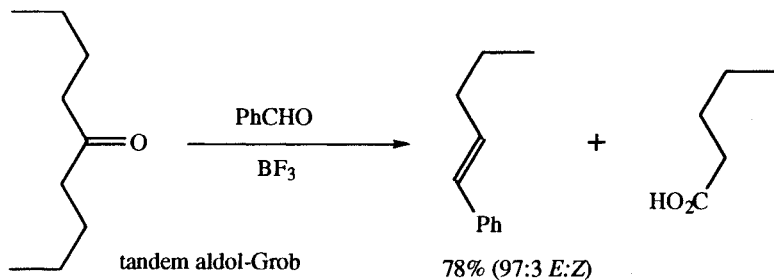
Khurana, J.M.; Sehgal, A. *Synth. Commun.*, **1996**, 26, 3791.

## SECTION 206: ALKENES FROM HYDRIDES

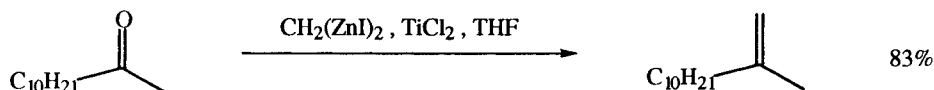
For conversions of methylenes to alkenes ( $\text{RCH}_2\text{R}' \rightarrow \text{RR}'\text{C}=\text{CH}_2$ ), see Section 200 (Alkenes from Alkyls).

NO ADDITIONAL EXAMPLES

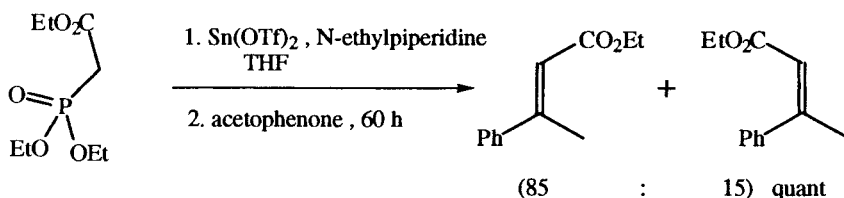
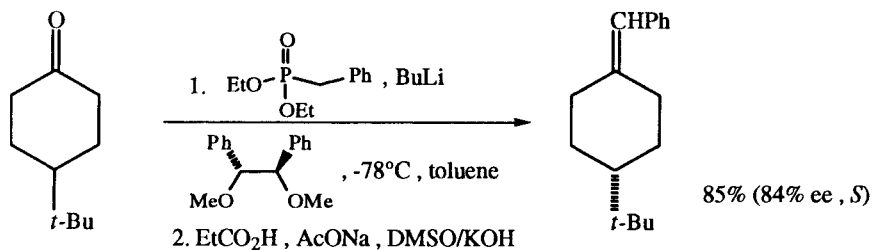
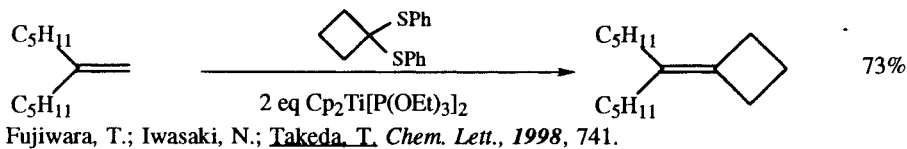
## SECTION 207: ALKENES FROM KETONES



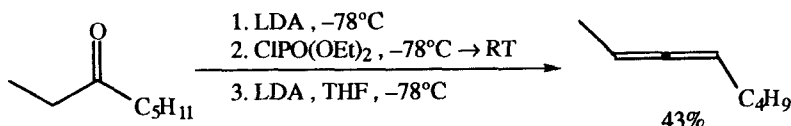
Kabalka, G.W.; Tejedor, D.; Li, N.-S.; Malladi, R.R.; Trotman, S.  
*J. Org. Chem.*, **1998**, 63, 6438.



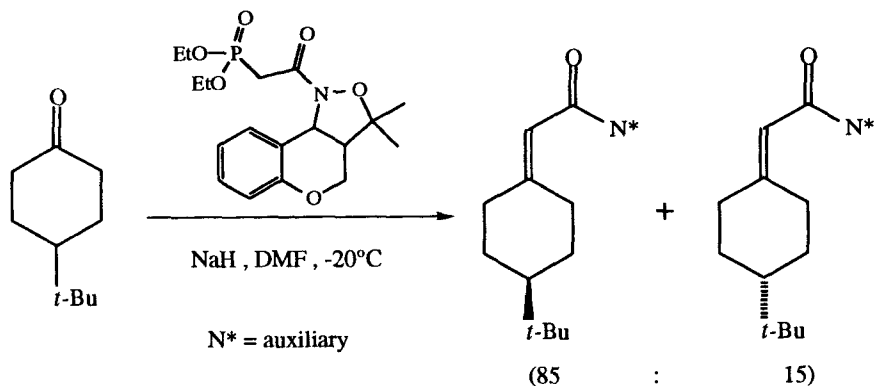
Matsubara, S.; Mizuno, T.; Otake, T.; Kobata, M.; Utimoto, K.; Takai, K.  
*SynLett*, **1998**, 1369.



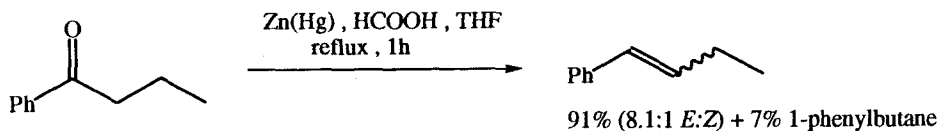
Sano, S.; Yokoyama, K.; Fukushima, M.; Yagi, T.; Nagao, Y. *Chem. Commun.*, **1997**, 559.



Brummond, K.M.; Dingess, E.A.; Kent, J.L. *J. Org. Chem.*, **1996**, 61, 6096.



Abiko, A.; Masamune, S. *Tetrahedron Lett.*, **1996**, 37, 1077.



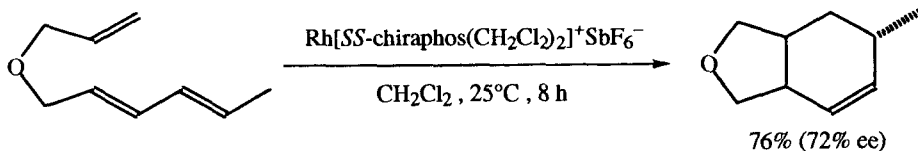
Hiegel, G.A.; Carney, J.R. *Synth. Commun.*, **1996**, 26, 2625.

Related Methods: Section 199 (Alkenes from Aldehydes).

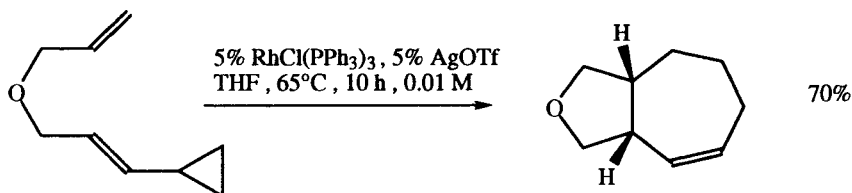
## SECTION 208: ALKENES FROM NITRILES

NO ADDITIONAL EXAMPLES

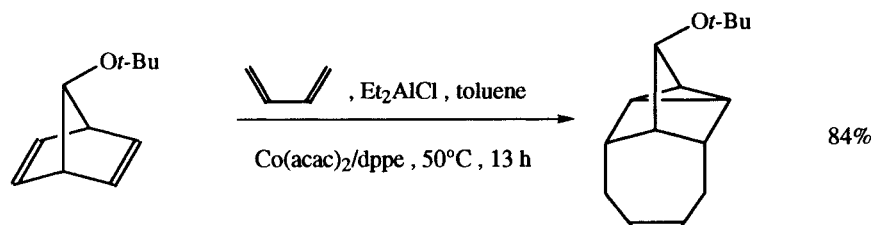
## SECTION 209: ALKENES FROM ALKENES



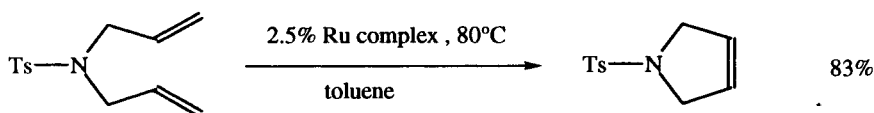
Gilbertson, S.R.; Hoge, G.S.; Genov, D.G. *J. Org. Chem.*, **1998**, 63, 10077.



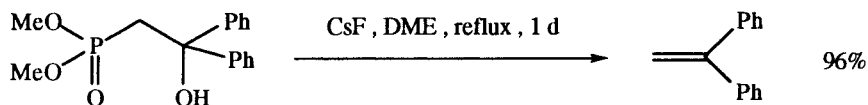
Wender, P.A.; Husfeld, C.O.; Langkopf, E.; Love, J.A. *J. Am. Chem. Soc.*, **1998**, *120*, 1940



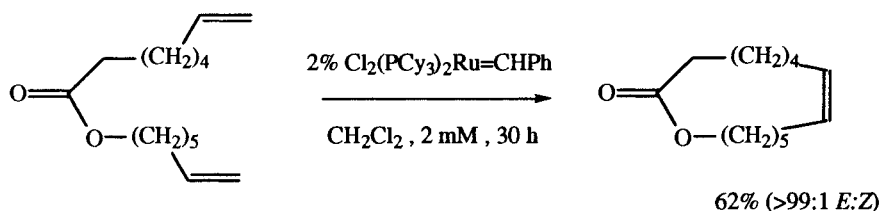
Chen, Y.; Snyder, J.K. *J. Org. Chem.*, **1998**, *63*, 2060.



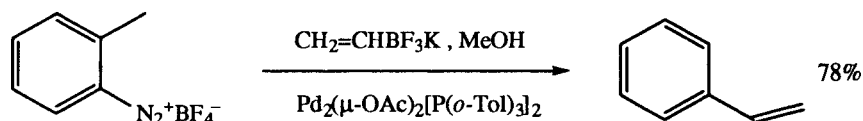
Fürstner, A.; Picquet, M.; Bruneau, C.; Dixneuf, P.H. *Chem. Commun.*, **1998**, 1315.



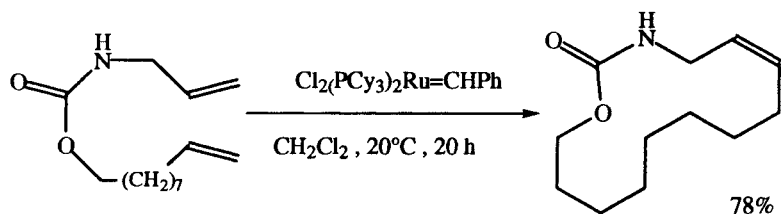
Kawashima, T.; Ishii, T.; Inamoto, N.; Tokitoh, N.; Okazaki, R.  
*Bull. Chem. Soc., Jpn.*, **1998**, *71*, 209.



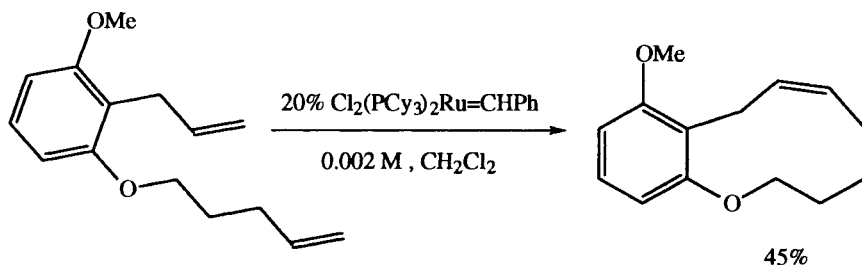
Goldring, W.P.D.; Hodder, A.S.; Weiler, L. *Tetrahedron Lett.*, **1998**, *39*, 4955.



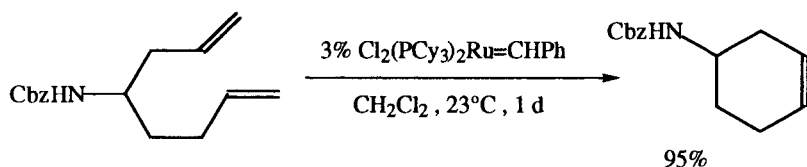
Darses, S.; Michaud, G.; Genêt, J.-P. *Tetrahedron Lett.*, **1998**, *39*, 5045.



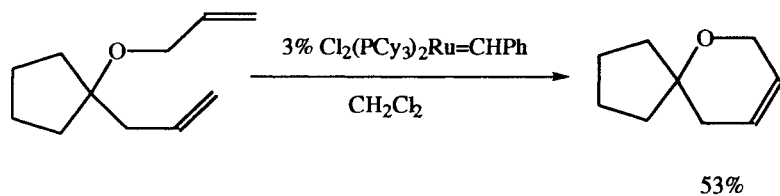
Chosh, A.K.; Hussain, K.A. *Tetrahedron Lett.*, **1998**, 39, 1881.



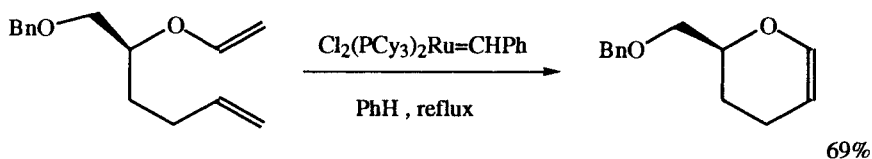
Stefinovic, M.; Snieckus, V. *J. Org. Chem.*, **1998**, 63, 2808.



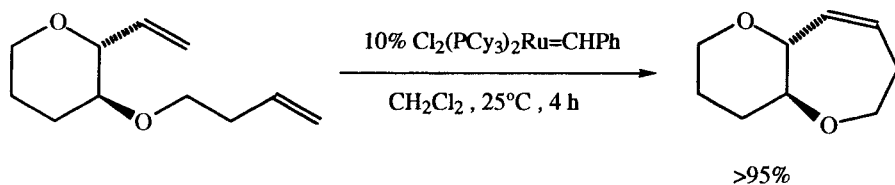
Maier, M.E.; Lapeva, T. *SynLett*, **1998**, 891.



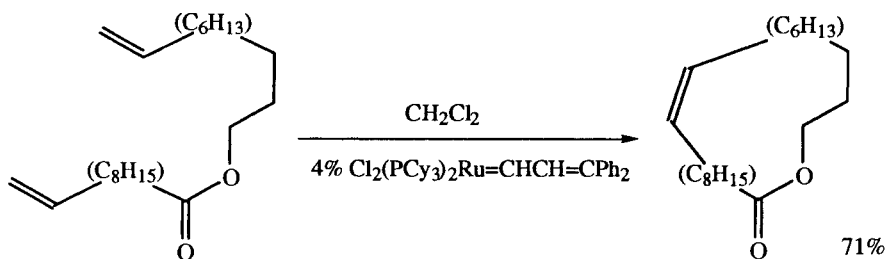
Maier, M.E.; Bugl, M. *SynLett*, **1998**, 1390.



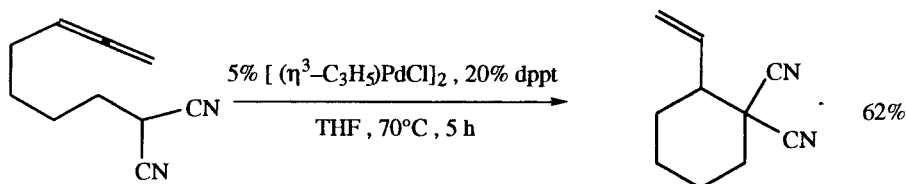
Sturino, C.E.; Wong, J.C.Y. *Tetrahedron Lett.*, **1998**, 39, 9623.



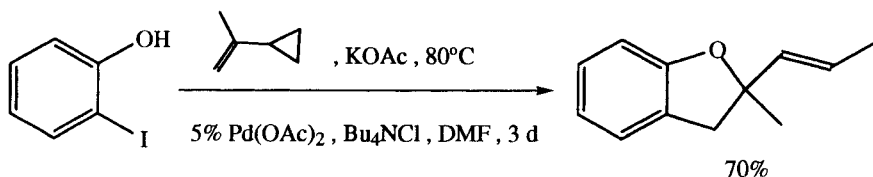
Delgado, M.; Martín, J.D. *Tetrahedron Lett*, **1997**, 38, 6299.



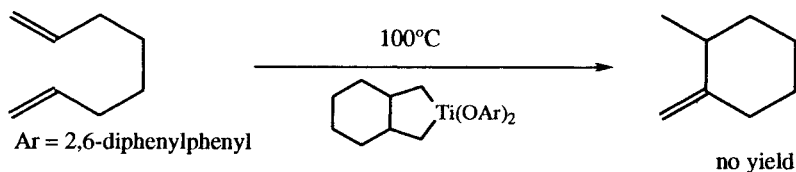
Fürstner, A.; Langemann, K. *J. Org. Chem.*, **1996**, 61, 3942.



Meguro, M.; Kamijo, S.; Yamamoto, Y. *Tetrahedron Lett*, **1996**, 37, 7453.

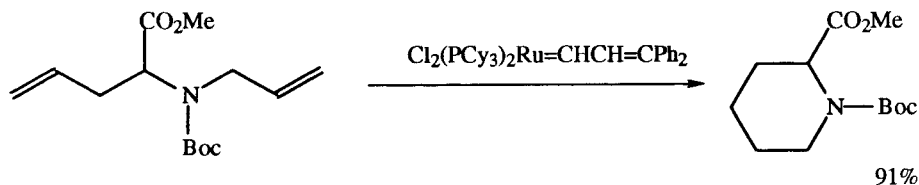


Larock, R.C.; Yum, E.K. *Tetrahedron*, **1996**, 52, 2743.



Wartuke, S.A.; Johnson, E.S.; Thorn, M.G.; Fanwick, P.E.; Rothwell, I.P.  
*Chem. Commun.* **1996**, 2617.





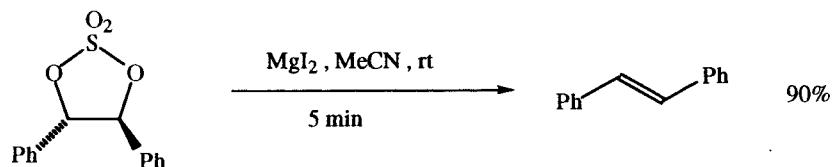
Miller, S.J.; Blackwell, H.E.; Grubbs, R.H. *J. Am. Chem. Soc.*, **1996**, 118, 9606.

# REVIEW:

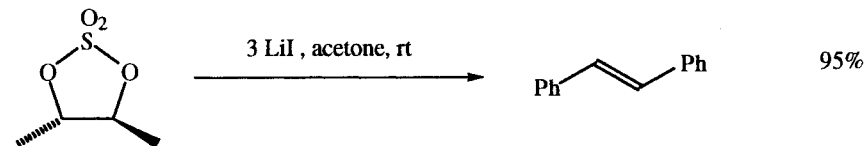
"The Asymmetric Heck Reaction"

Shibasaki, M.; Boden, D.J.; Kojima, A. *Tetrahedron*, **1997**, 53, 7371.

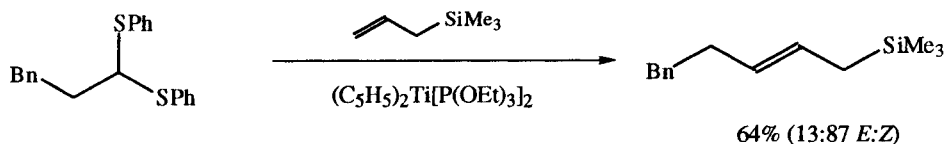
## SECTION 210: ALKENES FROM MISCELLANEOUS COMPOUNDS



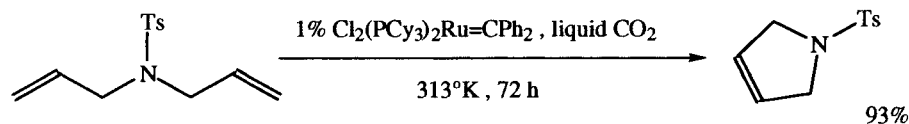
Jang, D.O.; Joo, Y.H. *Synth. Commun.*, **1998**, 28, 871.



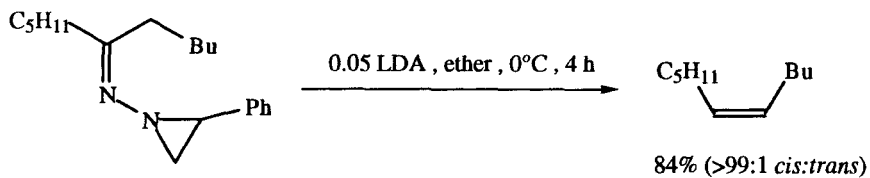
Jang, D.O.; Joo, Y.H. *SynLett*, **1997**, 279.



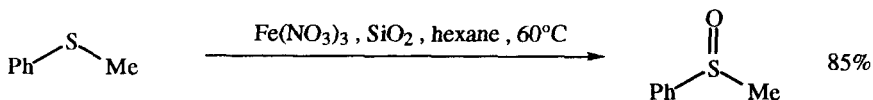
Fujiwara, T.; Takamori, M.; Takeda, T. *Chem. Commun.*, **1998**, 51.



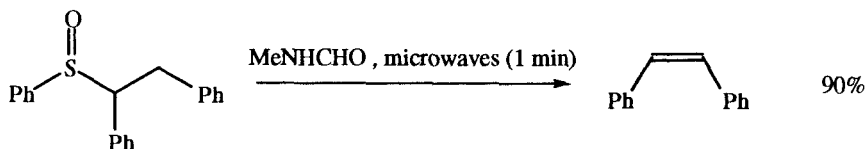
Fürstner, A.; Koch, D.; Langemann, K.; Leitner, W.; Six, C. *Angew. Chem. Int. Ed.*, **1997**, 36, 2466.



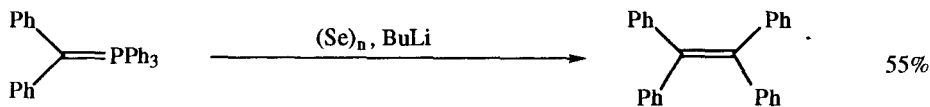
Maruoka, K.; Oishi, M.; Yamamoto, H. *J. Am. Chem. Soc.*, **1996**, 118, 2289.



Hivano, M.; Komiya, K.; Yakabe, S.; Clark, J.H.; Morimoto, T. *Org. Prep. Proceed. Int.*, **1996**, 28, 705.



Moghaddam, F.M.; Ghaffarzadeh, M. *Tetrahedron Lett.*, **1996**, 37, 1855.



Okuma, K.; Koda, G.; Okumura, S.; Ohno, A. *Chem. Lett.*, **1996**, 609.

## CHAPTER 15

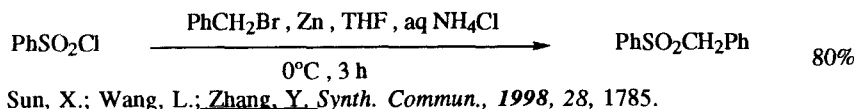
### PREPARATION OF OXIDES

This chapter contains reactions which prepare the oxides of nitrogen, sulfur and selenium. Included are *N*-oxides, nitroso and nitro compounds, nitrile oxides, sulfoxides, selenoxides and sulfones. Oximes are considered to be amines and appear in those sections. Preparation of sulfonic acid derivatives are found in Chapter Two and the preparation of sulfonates in Chapter Ten.

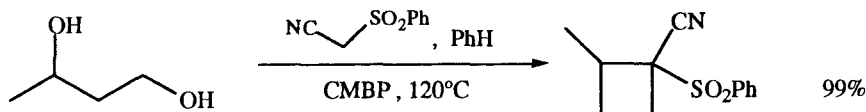
#### SECTION 211: OXIDES FROM ALKYNES

NO ADDITIONAL EXAMPLES

#### SECTION 212: OXIDES FROM ACID DERIVATIVES



#### SECTION 213: OXIDES FROM ALCOHOLS AND THIOLS



CMBP = cyanomethylenetriethylphosphorane

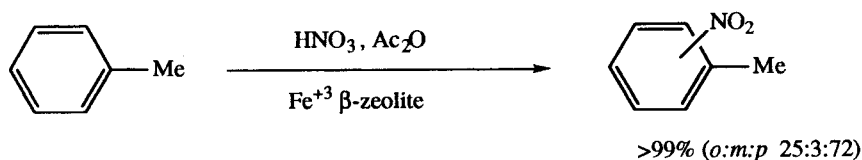
Tsunoda, T.; Nagino, C.; Oguri, M.; Itô, S. *Tetrahedron Lett.*, **1996**, 37, 2459.

Tsunoda, T.; Ozaki, F.; Shiiakata, N.; Tamaoka, Y.; Yamamoto, H.; Itô, S. *Tetrahedron Lett.*, **1996**, 37, 2463.

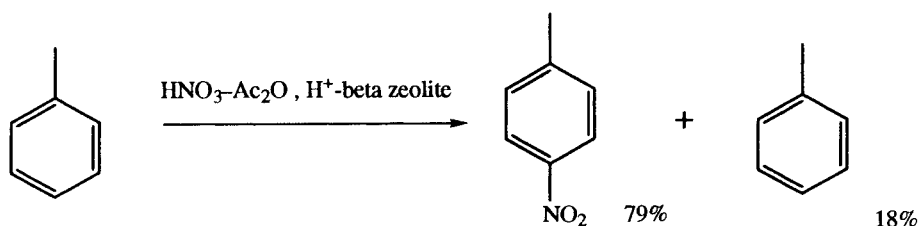
#### SECTION 214: OXIDES FROM ALDEHYDES

NO ADDITIONAL EXAMPLES

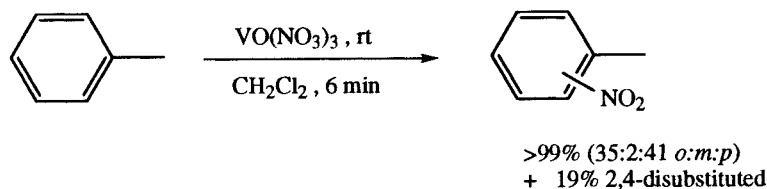
# SECTION 215: OXIDES FROM ALKYL, METHYLENES AND ARYLS



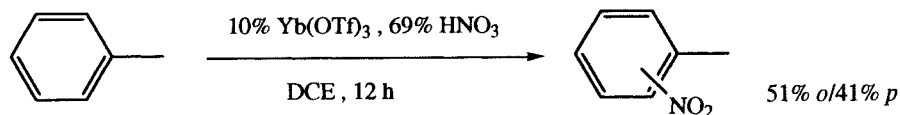
Smith, K.; Musson, A.; De Boos, G.A. *J. Org. Chem.*, **1998**, 63, 8448.



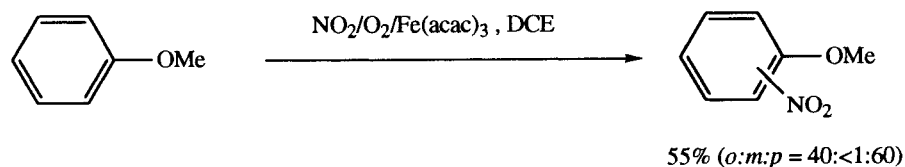
Smith, K.; Musson, A.; DeBoos, G.A. *Chem. Commun.*, **1996**, 469.



Dove, M.F.A.; Manz, B.; Montgomery, J.; Pattenden, G.; Wood, S.A. *J. Chem. Soc., Perkin Trans. 1*, **1998**, 1589.



Waller, F.J.; Barrett, A.G.M.; Braddock, D.C.; Ramprasad, D. *Chem. Commun.*, **1997**, 613.

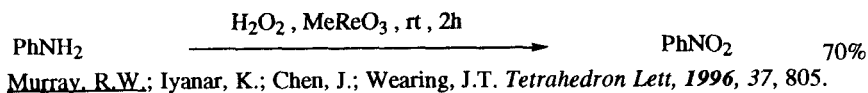


Suzuki, H.; Yonezawa, S.; Nonoyama, N.; Mori, T. *J. Chem. Soc., Perkin Trans. 1*, **1996**, 2385.

## SECTION 216: OXIDES FROM AMIDES

NO ADDITIONAL EXAMPLES

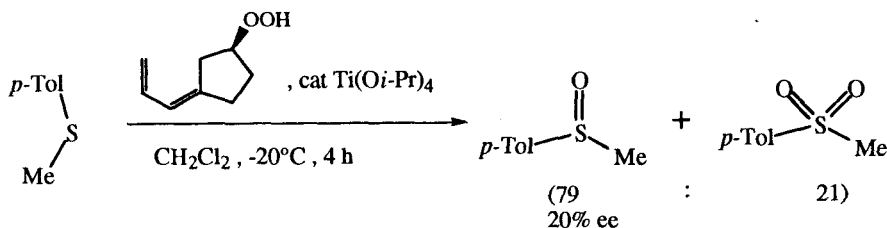
## SECTION 217: OXIDES FROM AMINES



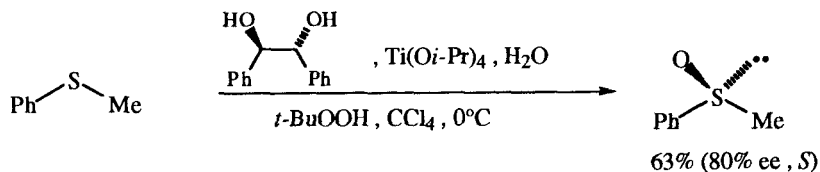
## SECTION 218: OXIDES FROM ESTERS

NO ADDITIONAL EXAMPLES

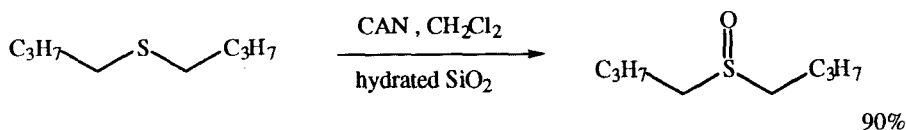
## SECTION 219: OXIDES FROM ETHERS, EPOXIDES AND THIOETHERS



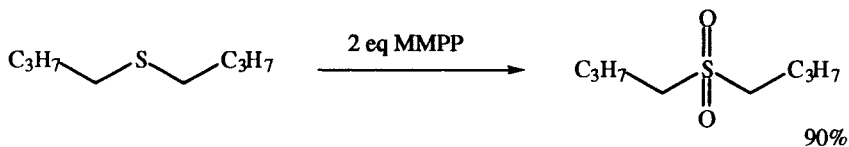
Adam, W.; Korb, M.N.; Roschmann, K.J.; Saha-Möller, C.R. *J. Org. Chem.*, **1998**, 63, 3423  
 95% conversion



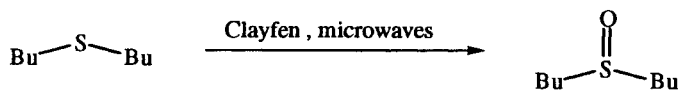
Donnoli, M.I.; Superchi, S.; Rosini, C. *J. Org. Chem.*, **1998**, 63, 9392.



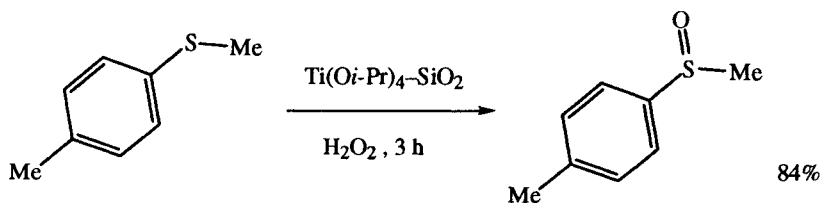
Ali, M.H.; Leach, D.R.; Schmitz, C.E. *Synth. Commun.*, **1998**, 28, 2969.



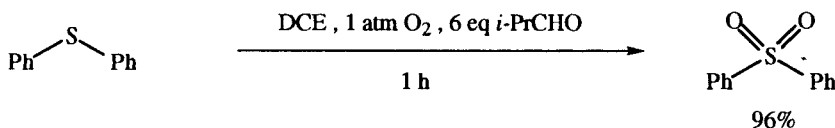
Ali, M.H.; Bohnert, C.J. *Synth. Commun.*, **1998**, 28, 2983.



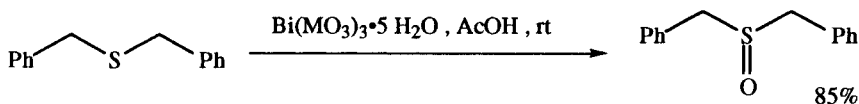
Varma, R.S.; Dahiya, R. *Synth. Commun.*, **1998**, 28, 4087.



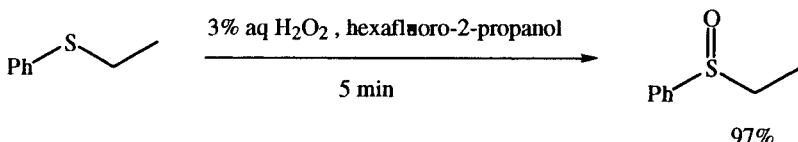
Faile, J.M.; García, J.I.; Lázaro, B.; Mayoral, J.A. *Chem. Commun.*, **1998**, 1807.



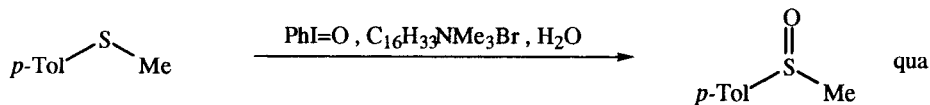
Rao, T.V.; Sain, B.; Kumar, K.; Murthy, P.S.; Rao, T.S.R.P.; Joshi, G.C. *Synth. Commun.*, **1998**, 28, 319.



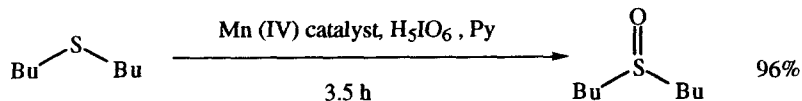
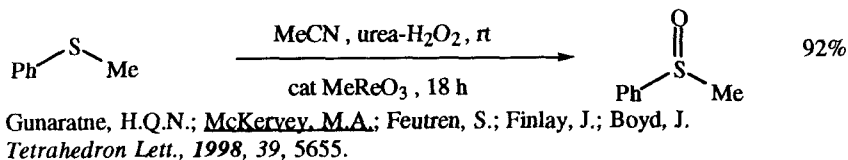
Masraqui, S.H.; Mudaliar, C.D.; Karnik, M.A. *Synth. Commun.*, **1998**, 28, 939.



Ravikumar, K.S.; Bégué, J.-P.; Bonnet-Delpon, D. *Tetrahedron Lett.*, **1998**, 39, 3141.

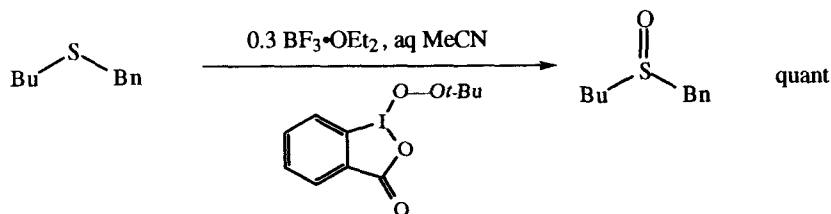


Tohma, H.; Takizawa, S.; Watanabe, H.; Kita, H. *Tetrahedron Lett.*, **1998**, 39, 4547.

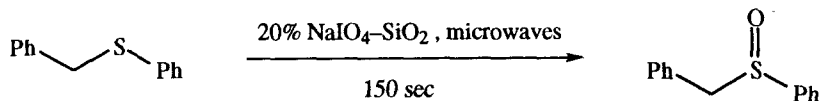


reaction overnight gives sulfones

Barton, D.H.R.; Li, W.; Smith, J.A. *Tetrahedron Lett.*, **1998**, 39, 7055.

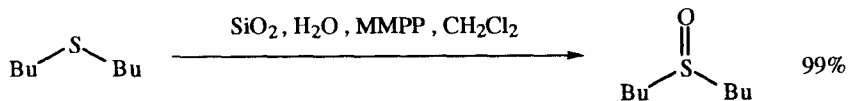


Ochiai, M.; Nakanishi, A.; Ito, T. *J. Org. Chem.*, **1997**, 62, 4253.



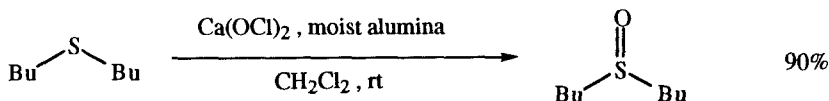
higher equivalents of reagent can lead to sulfones

Varma, R.S.; Saini, R.K.; Meshram, H.M. *Tetrahedron Lett.*, **1997**, 38, 6525.

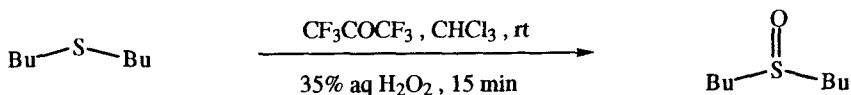


MMPP = magnesium monoperoxyphthalate

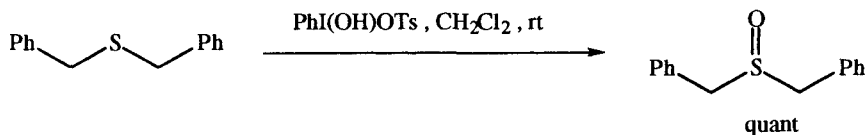
Ali, M.H.; Steven, W.C. *Synthesis*, **1997**, 764.



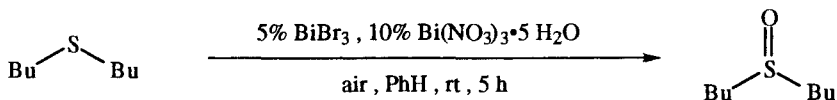
Hirano, M.; Yakabe, S.; Itoh, S.; Clark, J.H.; Morimotoa, T. *Synthesis*, **1997**, 1161.



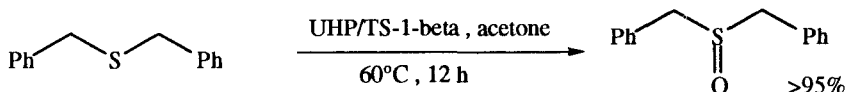
Lupattelli, P.; Ruzziconi, R.; Scafato, P. *Synth. Commun.*, **1997**, 27, 441.



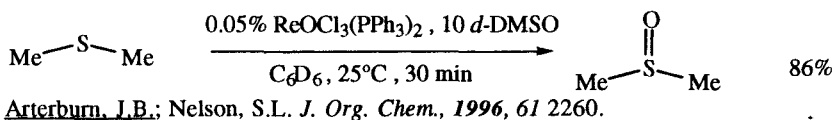
Xia, M.; Chen, Z.-C. *Synth. Commun.*, **1997**, 27, 1315.



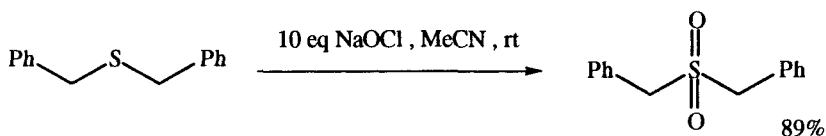
Komatsu, N.; Uda, M.; Suzuki, H. *Chem. Lett.*, **1997**, 1229.



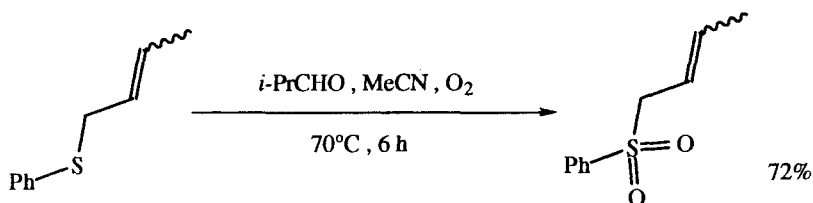
TS-1 = microporous titanium silicate ; UHP = urea adduct of hydrogen peroxide  
Reddy, T.I.; Varma, R.S. *Chem. Commun.*, **1997**, 471.



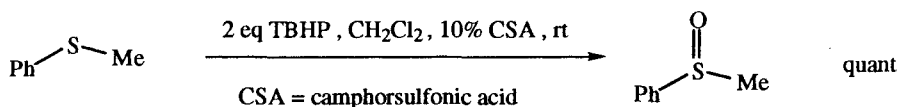
Arterburn, J.B.; Nelson, S.L. *J. Org. Chem.*, **1996**, 61 2260.



Khurana, J.M.; Panda, A.K.; Rag, A.; Gogia, A. *Org. Prep. Proceed. Int.*, **1996**, 28, 234.

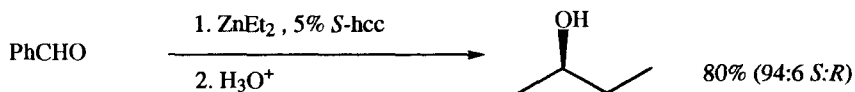


Khanna, V.; Maikap, G.C.; Iqbal, J. *Tetrahedron Lett.*, **1996**, 37, 3367.



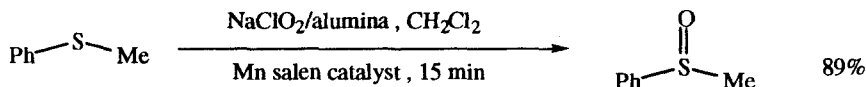
Bonadies, F.; De Angelis, F.; Locati, L.; Scettri, A. *Tetrahedron Lett.*, **1996**, 37, 7129.



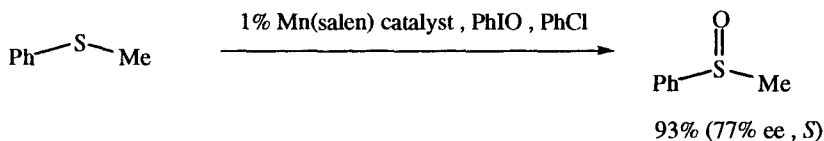


hcc = hyperbranched chiral catalysts

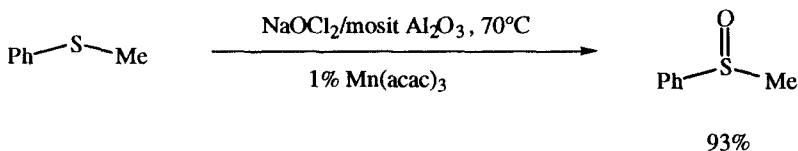
Brunel, J.M.; Kagan, H.B. *SynLett*, **1996**, 404.



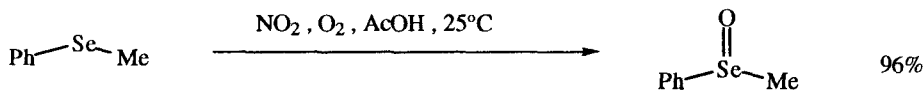
Hirano, M.; Yakabe, S.; Clark, J.H.; Kudo, H.; Morimoto, T. *Synth. Commun.*, **1996**, 26, 1875.



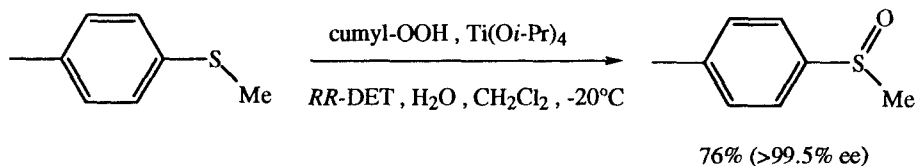
Kokubo, C.; Katsuki, T. *Tetrahedron*, **1996**, 52, 13895.



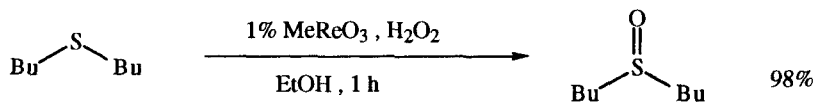
Hirano, M.; Yakabe, S.; Clark, J.H.; Morimoto, T. *J. Chem. Soc., Perkin Trans. 1*, **1996**, 2693.



Bosch, E.; Kochi, J.K. *J. Chem. Soc., Perkin Trans. 1*, **1996**, 2731.



Brunel, J.-M.; Kagan, H.B. *Bull. Soc. Chim. Fr.*, **1996**, 133, 1109.

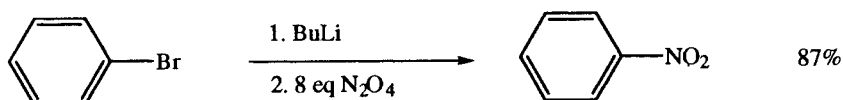


Yamazaki, S. *Bull. Chem. Soc. Jpn.*, **1996**, 69, 2955.

**REVIEW:**

"Enantioselective Oxidation of Sulfides to Sulfoxides Catalyzed by Bacterial Cyclohexanone Monooxygenases."

Colonna, S.; Gaggero, N.; Pasta, P.; Ottolina, G. *Chem. Commun.*, **1996**, 2303.

**SECTION 220: OXIDES FROM HALIDES AND SULFONATES**

Tani, K.; Lukin, K.; Eaton, P.E. *J. Am. Chem. Soc.*, **1997**, *119*, 1476.

**SECTION 221: OXIDES FROM HYDRIDES**

NO ADDITIONAL EXAMPLES

**SECTION 222: OXIDES FROM KETONES**

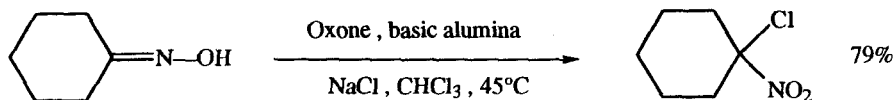
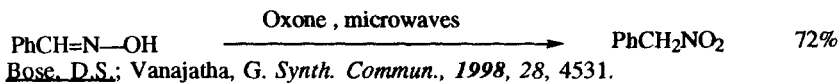
NO ADDITIONAL EXAMPLES

**SECTION 223: OXIDES FROM NITRILES**

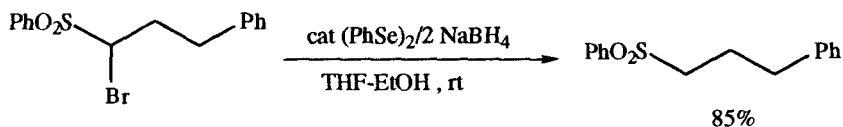
NO ADDITIONAL EXAMPLES

**SECTION 224: OXIDES FROM ALKENES**

NO ADDITIONAL EXAMPLES

**SECTION 225:      OXIDES FROM MISCELLANEOUS COMPOUNDS**

Ceccherelli, P.; Curini, M.; Epifano, F.; Marcotullio, M.C.; Rosati, O.  
*Tetrahedron Lett.*, **1998**, 39, 4385.

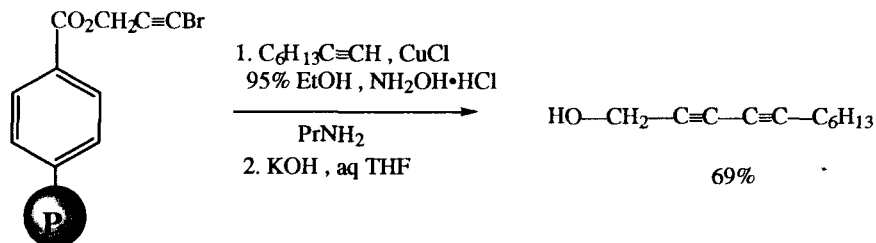


Yoshimatsu, M.; Ohara, M. *Tetrahedron Lett.*, **1997**, 38, 5651.

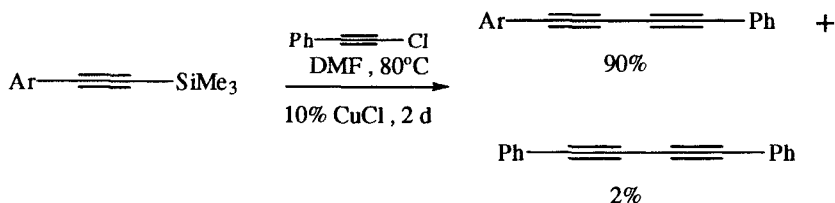
## CHAPTER 16

# PREPARATION OF DIFUNCTIONAL COMPOUNDS

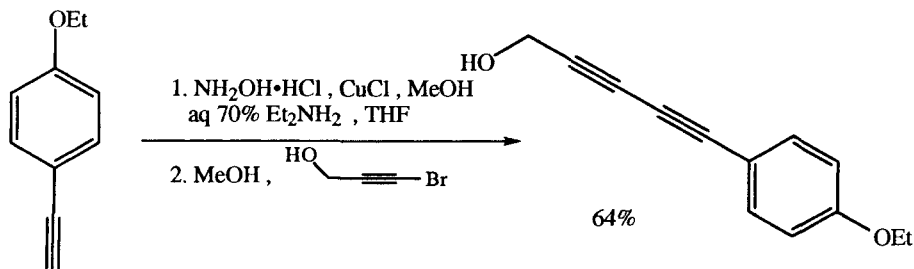
### SECTION 300: ALKYNE - ALKYNE



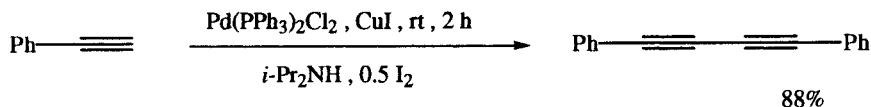
Montierth, J.M.; DeMario, D.R.; Kurth, M.J.; Schore, N.E. *Tetrahedron*, **1998**, *54*, 11745.



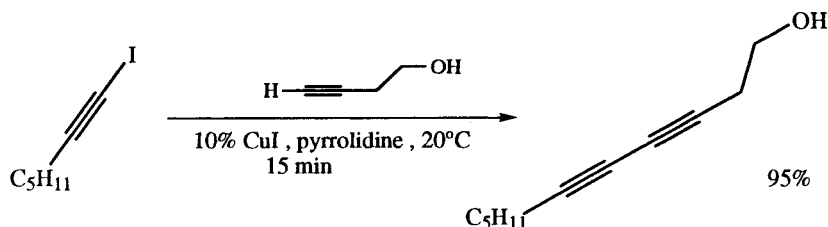
Nishihara, Y.; Ikegashira, K.; Mori, A.; Hiyama, T. *Tetrahedron Lett.*, **1998**, *39*, 4075.



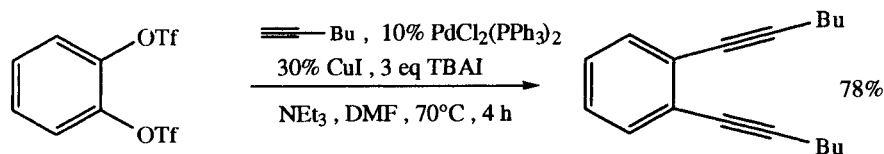
Godt, A. *J. Org. Chem.*, **1997**, *62*, 7471.



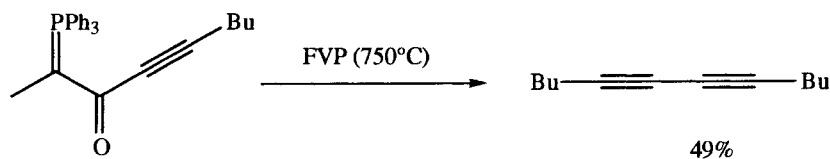
Liu, Q.; Burton, D.J. *Tetrahedron Lett.*, **1997**, 38, 4371.



Alami, M.; Ferri, F. *Tetrahedron Lett.*, **1996**, 37, 2763.



Powell, N.A.; Rychnovsky, S.D. *Tetrahedron Lett.*, **1996**, 37, 7901.



Aitken, R.A.; Hérion, H.; Horsburgh, C.E.R.; Karodia, N.; Seth, S. *J. Chem. Soc., Perkin Trans. 1*, **1996**, 485.

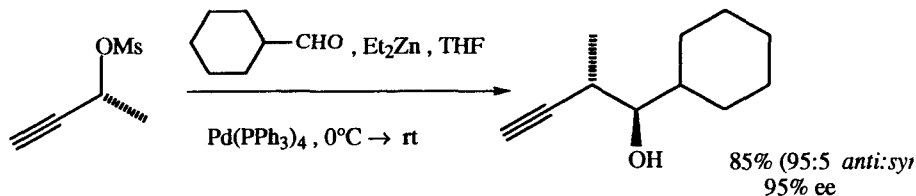
## SECTION 301: ALKYNE - ACID DERIVATIVES

NO ADDITIONAL EXAMPLES

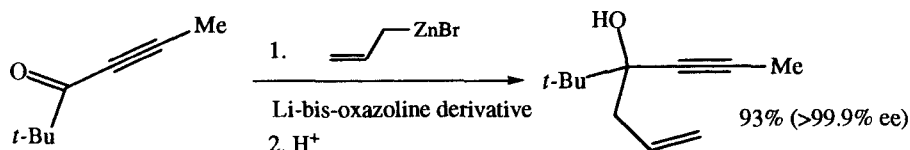
## SECTION 302: ALKYNE - ALCOHOL, THIOL



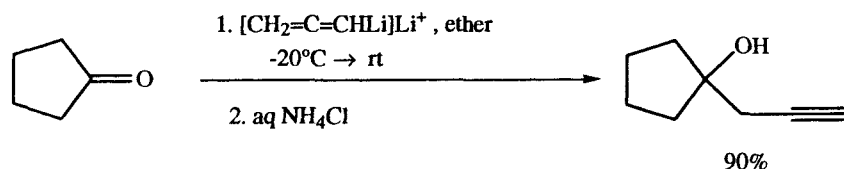
Dollinger, L.M.; Howell, A.R. *J. Org. Chem.*, **1998**, 63, 6782.



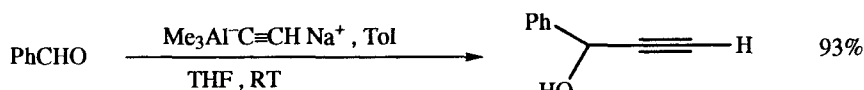
Marshall, J.A.; Adams, N.D. *J. Org. Chem.*, **1998**, 63, 3812.



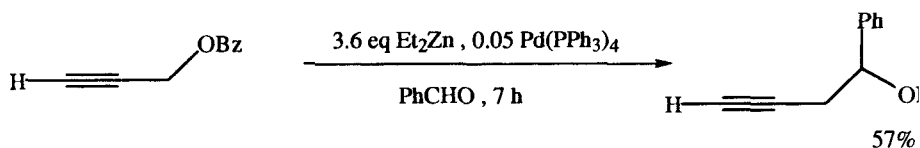
Nakamura, M.; Hirai, A.; Sogi, M.; Nakamura, E. *J. Am. Chem. Soc.*, **1998**, 120, 5846.



Cabezas, J.A.; Alvarez, L.X. *Tetrahedron Lett.*, **1998**, 39, 3935.

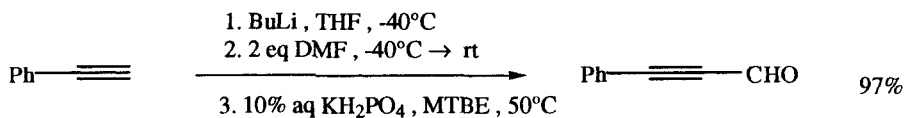


Joung, M.J.; Ahn, J.H.; Yoon, N.M. *J. Org. Chem.*, **1996**, 61, 4472.



Tamaru, Y.; Goto, S.; Tanaka, A.; Shimizu, M.; Kimura, M.  
*Angew. Chem. Int. Ed.*, **1996**, 35, 878.

## SECTION 303: ALKYNE - ALDEHYDE



Journet, M.; Cai, D.; DiMichele, L.M.; Larsen, R.D. *Tetrahedron Lett.*, **1998**, 39, 6427.

**SECTION 304: ALKYNE - AMIDE**

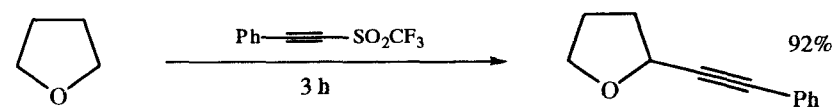
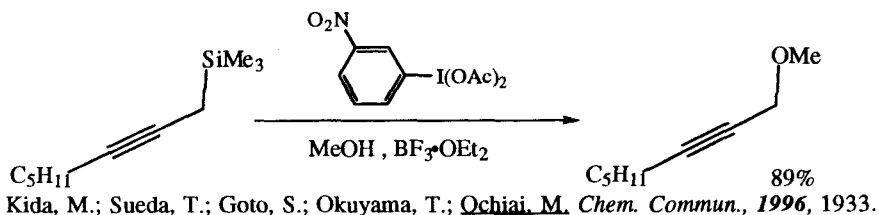
NO ADDITIONAL EXAMPLES

**SECTION 305: ALKYNE - AMINE**

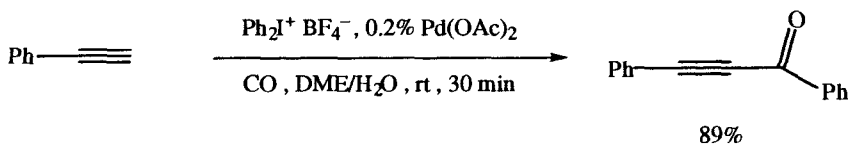
NO ADDITIONAL EXAMPLES

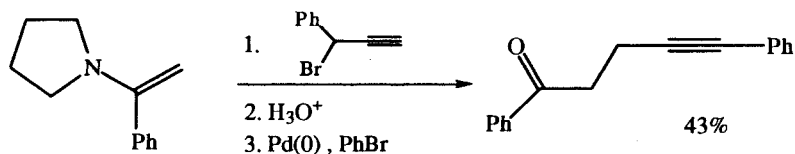
**SECTION 306: ALKYNE - ESTER**

NO ADDITIONAL EXAMPLES

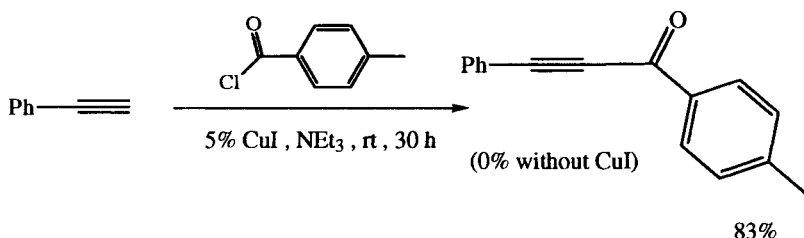
**SECTION 307: ALKYNE - ETHER, EPOXIDE, THIOETHER**Gong, J.; Fuchs, P.L. *J. Am. Chem. Soc.*, **1996**, 118, 4486.Kida, M.; Sueda, T.; Goto, S.; Okuyama, T.; Ochiai, M. *Chem. Commun.*, **1996**, 1933.**SECTION 308: ALKYNE - HALIDE**

NO ADDITIONAL EXAMPLES

**SECTION 309: ALKYNE - KETONE**Kang, S.-K.; Lim, K.-H.; Ho, P.-S.; Kim, W.-Y. *Synthesis*, **1997**, 874.



Arcadi, A.; Marinelli, F.; Pini, E.; Rossi, E. *Tetrahedron Lett.*, **1996**, 37, 3387.

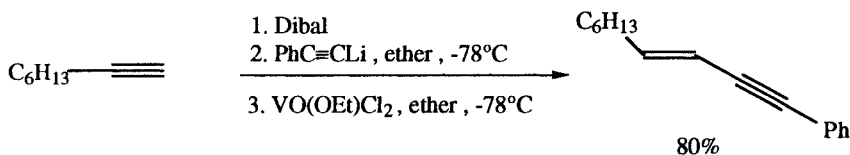


Choudhury, C.; Kundu, N.G. *Tetrahedron Lett.*, **1996**, 37, 7323.

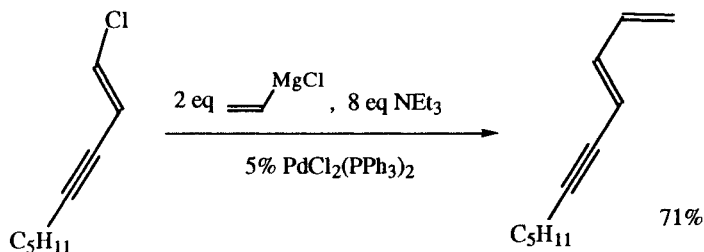
## SECTION 310: ALKYNE - NITRILE

NO ADDITIONAL EXAMPLES

## SECTION 311: ALKYNE - ALKENE

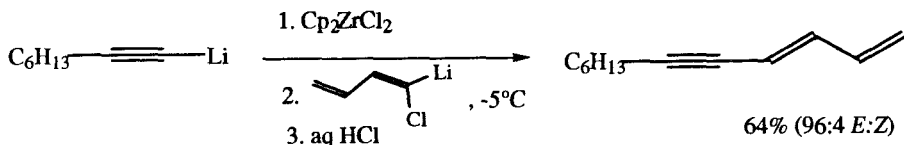


Ishikawa, T.; Ogawa, A.; Hirao, T. *J. Am. Chem. Soc.*, **1998**, 120, 5124.

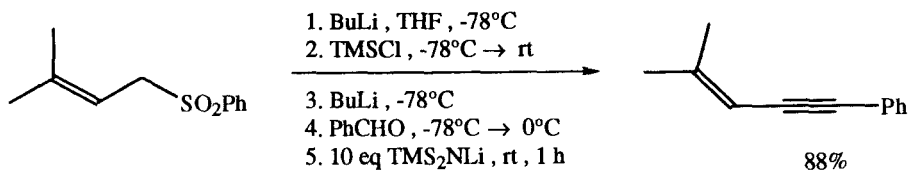


Ramiandrasoa, P.; Bréhon, B.; Thivet, A.; Alami, M.; Chaiez, G. *Tetrahedron Lett.*, **1997**, 38, 2447.



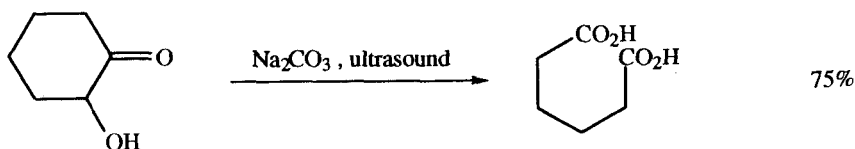


Kasatkin, A.; Whitby, R.J. *Tetrahedron Lett.*, **1997**, 38, 4857.



Orita, A.; Yoshioka, N.; Otera, J. *Chem. Lett.*, **1997**, 1023.

## SECTION 312: CARBOXYLIC ACID - CARBOXYLIC ACID



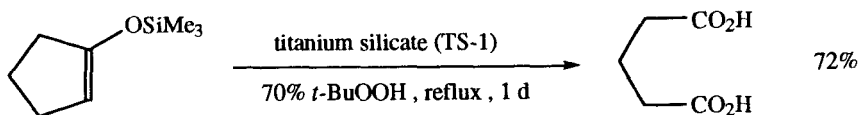
Yang, D.T.C.; Cao, Y.H.; Evans, T.T.; Kabalka, G.W. *Synth. Commun.*, **1996**, 26, 4275.

Also, with NaOCl and ultrasound; 87%.

Yang, D.T.C.; Zhang, C.J.; Fu, P.P.; Kabalka, G.W. *Synth. Commun.*, **1997**, 27, 1601.

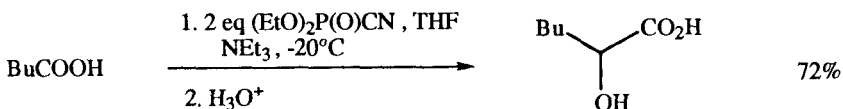
Also, with NaOCl and microwaves; 86%.

Yang, D.T.C.; Zhang, C.J.; Haynie, B.C.; Fu, P.P.; Kabalka, G.W. *Synth. Commun.*, **1997**, 27, 3235.

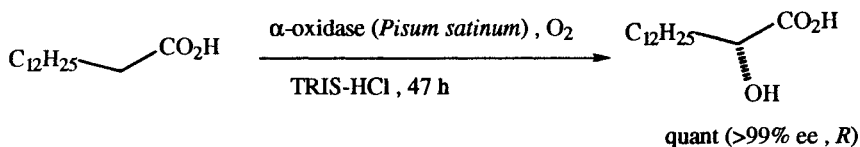


Raju, S.V.N.; Upadhyaya, T.T.; Ponrathnam, S.; Daniel, T.; Sudalai, A. *Chem. Commun.*, **1996**, 1969.

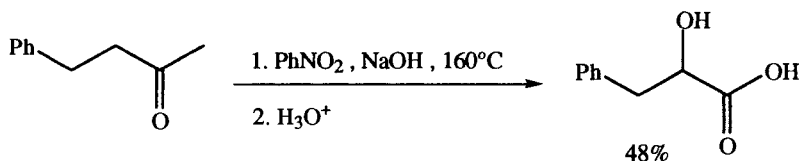
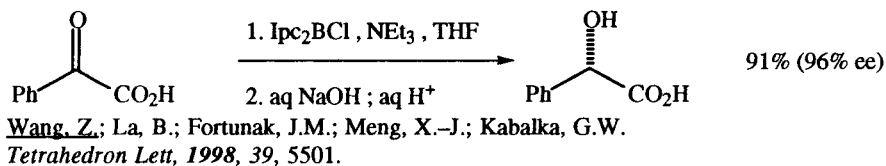
## SECTION 313: CARBOXYLIC ACID - ALCOHOL, THIOL



Mizuno, M.; Shioiri, T. *Tetrahedron Lett.*, **1998**, 39, 9209.



Adam, W.; Boland, W.; Hartmann-Schreier, J.; Humpf, H.-U.; Lazarus, M.; Saffert, A.; Saha-Möller, C.R.; Schreier, P. *J. Am. Chem. Soc.*, **1998**, *120*, 11044.

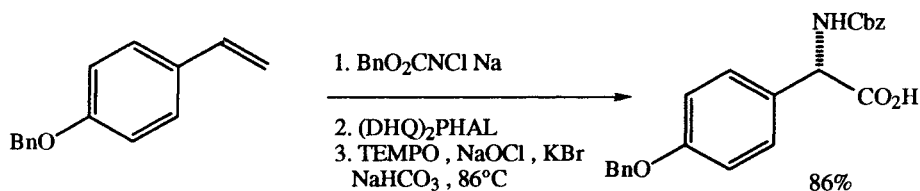


Srinivasan, P.S.; Mahesh, R.; Rao, G.V.; Kalyanam, N. *Synth. Commun.*, **1996**, *26*, 2161.

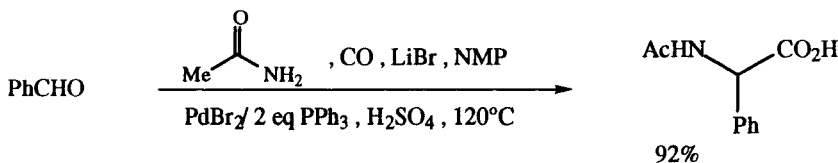
## SECTION 314: CARBOXYLIC ACID - ALDEHYDE

NO ADDITIONAL EXAMPLES

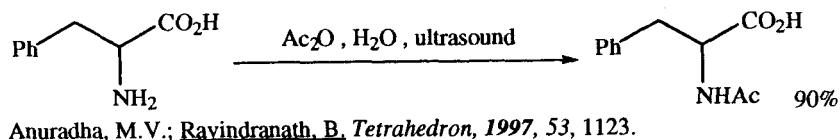
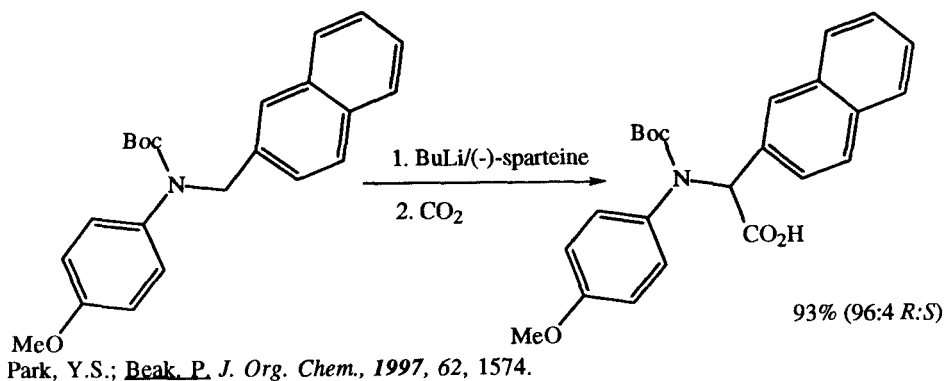
## SECTION 315: CARBOXYLIC ACID - AMIDE



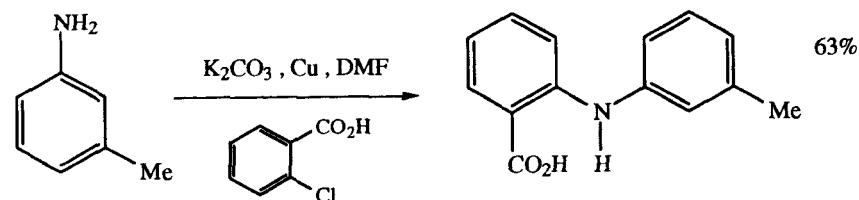
Reddy, K.L.; Sharpless, K.B. *J. Am. Chem. Soc.*, **1998**, *120*, 1207.



Beller, M.; Eckert, M.; Holla, E.W. *J. Org. Chem.*, **1998**, *63*, 5658.



## SECTION 316: CARBOXYLIC ACID - AMINE

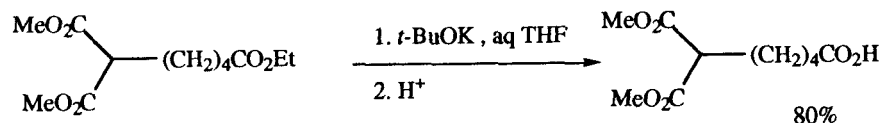


Pellón, R.E.; Carrasco, R.; Márquez, T.; Mamposo, T. *Tetrahedron Lett.*, **1997**, 38, 5107.

Related Methods:

Section 315 (Carboxylic Acid - Amide).  
Section 344 (Amide - Ester).  
Section 351 (Amine - Ester).

## SECTION 317: CARBOXYLIC ACID - ESTER

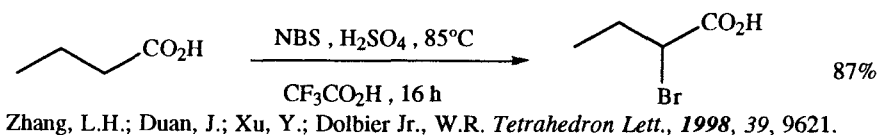


Wilk, B.K. *Synth. Commun.*, **1996**, 26, 3859.

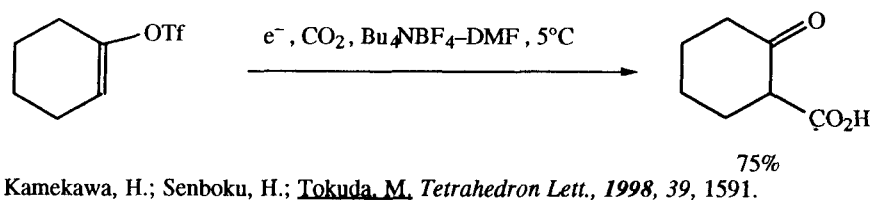
**SECTION 318: CARBOXYLIC ACID - ETHER, EPOXIDE, THIOETHER**

NO ADDITIONAL EXAMPLES

**SECTION 319: CARBOXYLIC ACID - HALIDE, SULFONATE**



**SECTION 320: CARBOXYLIC ACID - KETONE**



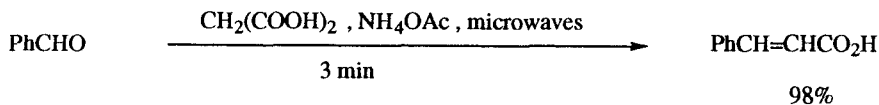
Also via: Section 360 (Ketone - Ester).

**SECTION 321: CARBOXYLIC ACID - NITRILE**

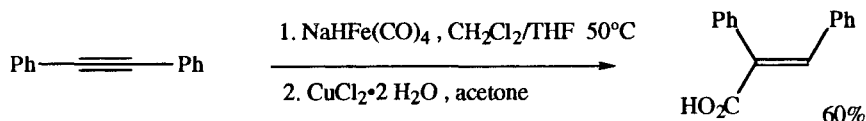
NO ADDITIONAL EXAMPLES

Also via: Section 361 (Nitrile - Ester).

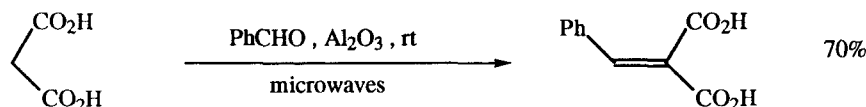
**SECTION 322: CARBOXYLIC ACID - ALKENE**



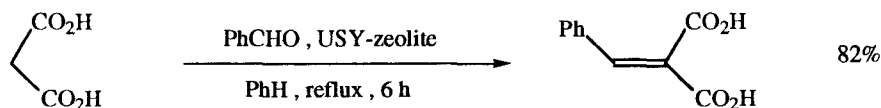
Kumar, H.M.S.; Subbareddy, B.V.; Anjaneyulu, S.; Yadav, J.S. *Synth. Commun.*, **1998**, 28, 3811.



Periasamy, M.; Radhakrishnan, U.; Ramesh Kumar, C.; Brunet, J.-J. *Tetrahedron Lett.*, **1997**, 38, 1623.



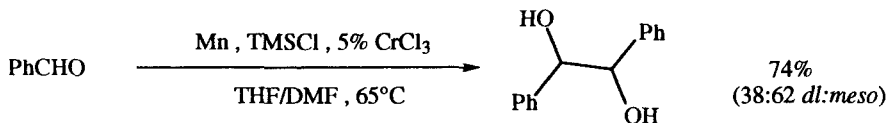
Kwon, P.-S.; Kim, Y.-M.; Kang, C.-J.; Kwon, T.-W. *Synth. Commun.*, **1997**, 27, 4091.



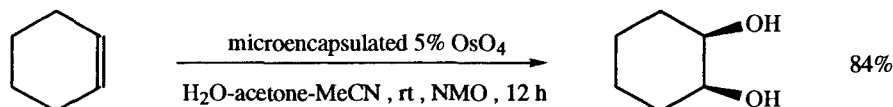
Wang, Q.L.; Ma, Y.D.; Zuo, B.J. *Synth. Commun.*, **1997**, 27, 4107.

Also via:      Section 313 (Alcohol - Carboxylic Acids).  
                  Section 349 (Amide - Alkene).  
                  Section 362 (Ester - Alkene).  
                  Section 376 (Nitrile - Alkene).

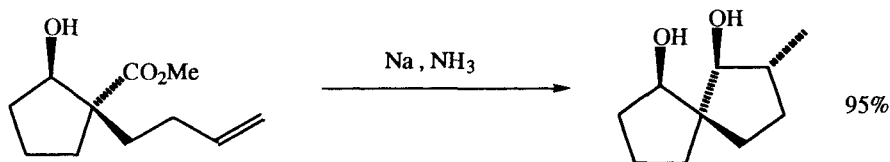
## SECTION 323: ALCOHOL, THIOL - ALCOHOL, THIOL



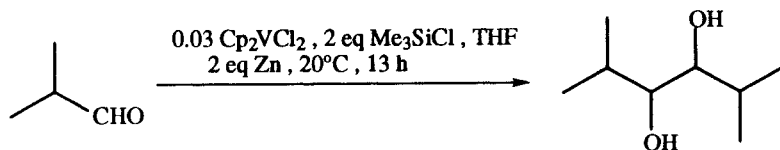
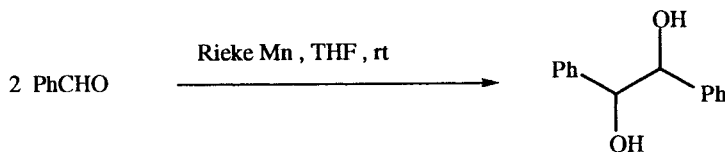
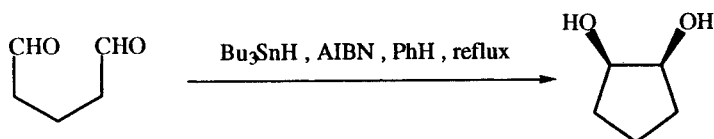
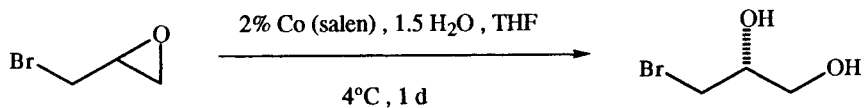
Svatoš, A.; Boland, W. *SynLett*, **1998**, 549.



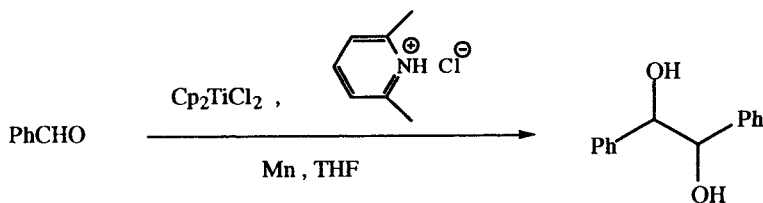
Nagayama, S.; Endo, M.; Kobayashi, S. *J. Org. Chem.*, **1998**, 63, 6094.

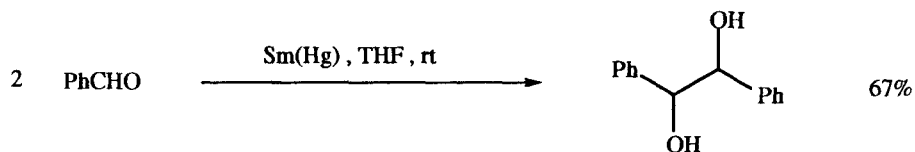


Cossy, J.; Gille, B.; Bellosta, V. *J. Org. Chem.*, **1998**, 63, 3141.

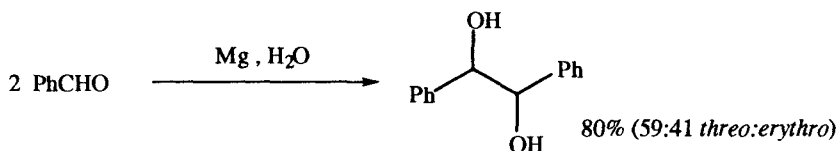
89% (91:9 *dl:meso*)Hirao, T.; Asahara, M.; Muguruma, Y.; Ogawa, A. *J. Org. Chem.*, **1998**, 63, 2812.64% (63:37 *dl:meso*)Rieke, R.D.; Kim, S.-H. *J. Org. Chem.*, **1998**, 63, 5235.46% (98:1 *cis:trans*)Hays, D.S.; Fu, G.C. *J. Org. Chem.*, **1998**, 63, 6375.

93% (96% ee)

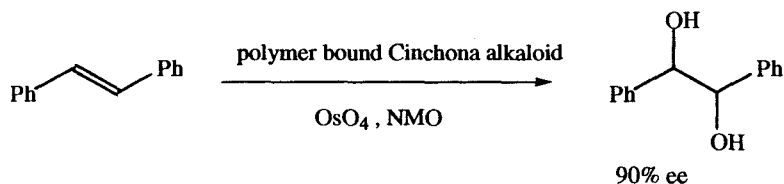
Furrow, M.E.; Schaus, S.E.; Jacobsen, E.N. *J. Org. Chem.*, **1998**, 63, 6776.75% (82:18 *syn:anti*)Gansäuer, A.; Bauer, D. *Eur. J. Org. Chem.*, **1998**, 2673.



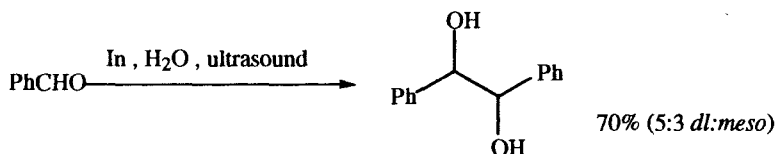
Wang, L.; Zhang, Y. *Synth. Commun.*, **1998**, 28, 3991.



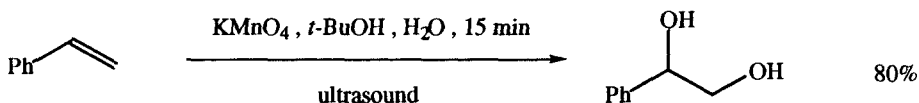
Zhang, W.-C.; Li, C.-L. *J. Chem. Soc., Perkin Trans. 1*, **1998**, 3131.



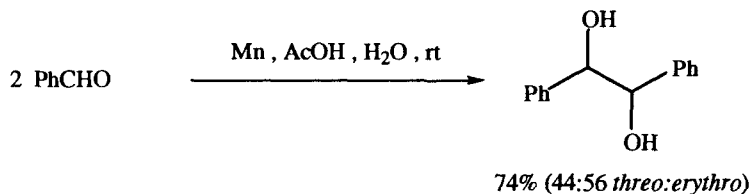
Bolm, C.; Gerlach, A. *Eur. J. Org. Chem.*, **1998**, 21.



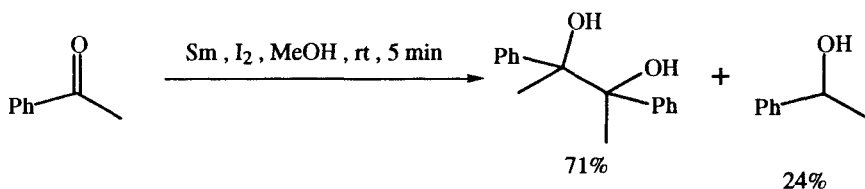
Lim, H.J.; Keum, G.; Kang, S.B.; Chung, B.Y.; Kim, Y. *Tetrahedron Lett.*, **1998**, 39, 4367.



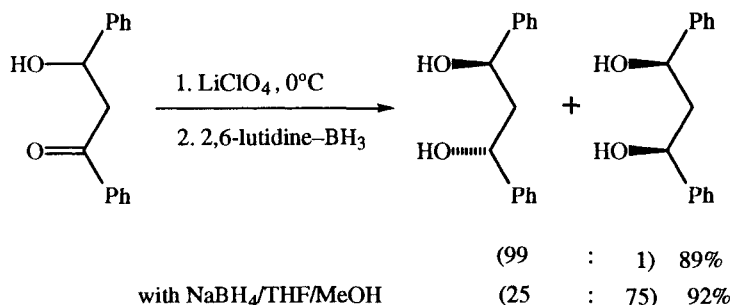
Varma, R.S.; Naicker, K.P. *Tetrahedron Lett.*, **1998**, 39, 7463.



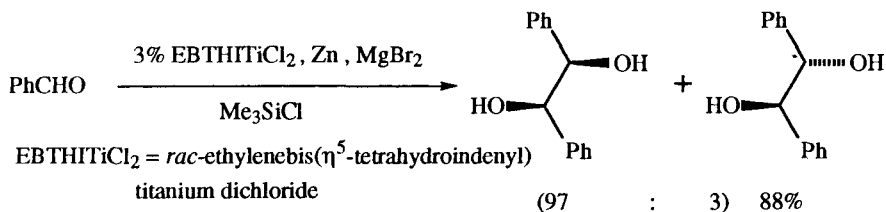
Li, C.-L.; Meng, Y.; Yi, X.-H. *J. Org. Chem.*, **1997**, 62, 8632.



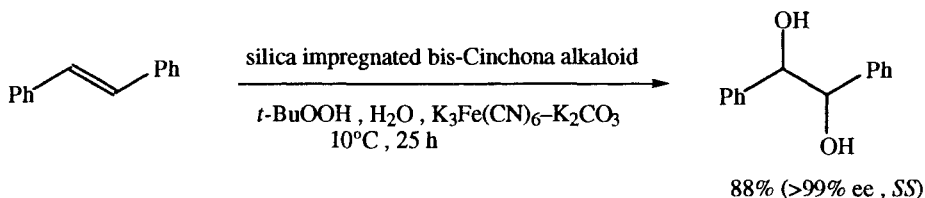
Yanada, R.; Negoro, N.; Yanada, K.; Fujita, T. *Tetrahedron Lett.*, **1997**, 38, 3271.



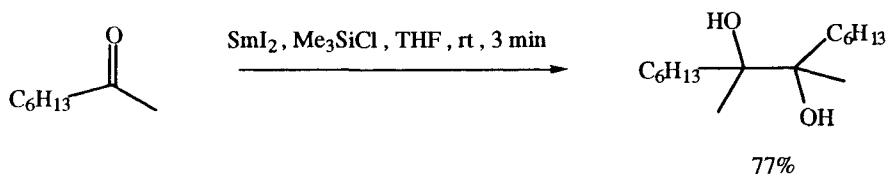
Narayana, C.; Reddy, M.R.; Hair, M.; Kabalka, G.W. *Tetrahedron Lett.*, **1997**, 38, 7705.



Gansäuer, A. *SynLett*, **1997**, 363.

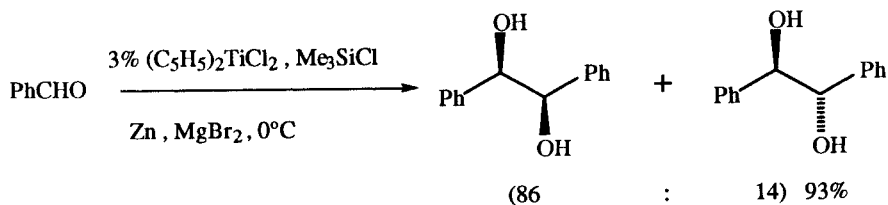


Song, C.E.; Yang, J.W.; Ha, H.-J. *Tetrahedron Asymmetry*, **1997**, 8, 841.

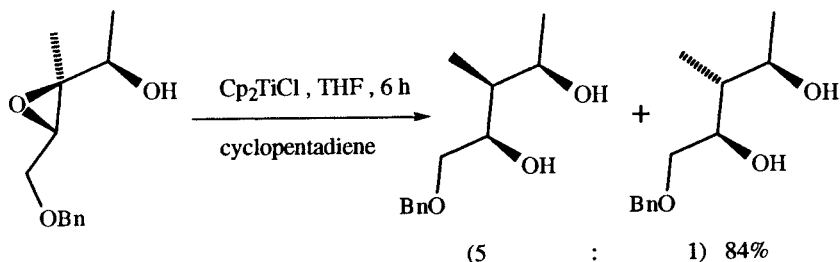


Honda, T.; Katoh, M. *Chem. Commun.*, **1997**, 369.

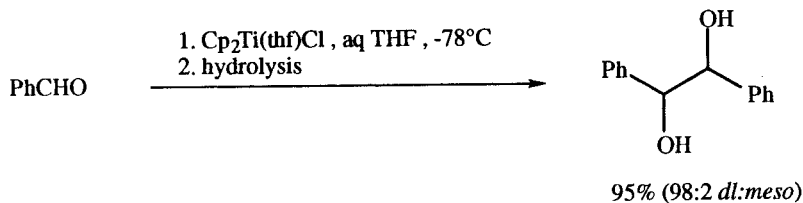




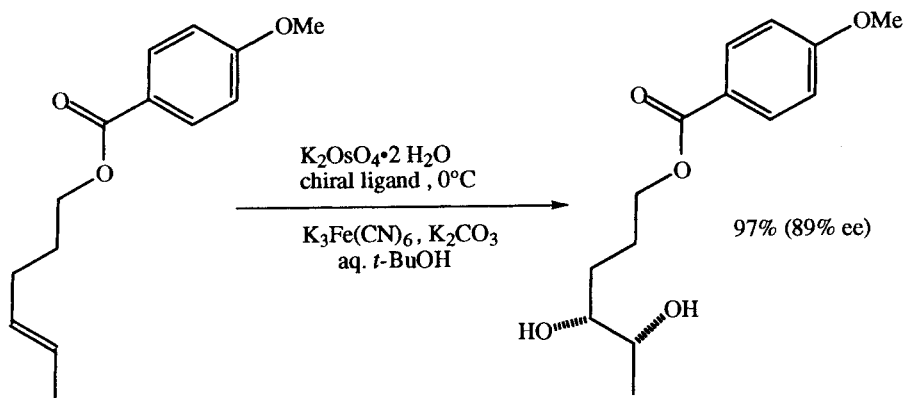
Gansäuer, A. *Chem. Commun.*, **1997**, 457.



Chakraborty, T.K.; Dutta, S. *J. Chem. Soc., Perkin Trans. 1*, **1997**, 1257.

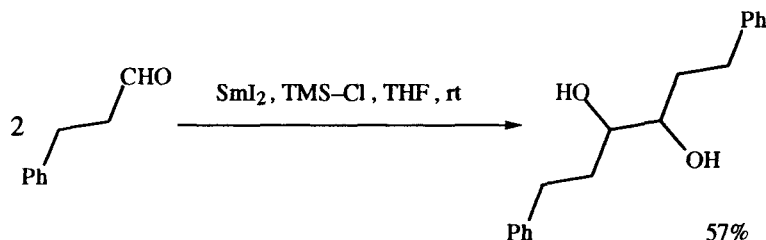


Barden, M.C.; Schwartz, I. *J. Am. Chem. Soc.*, **1996**, 118, 5484.

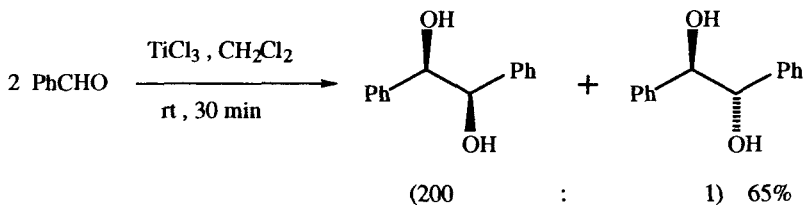


Corey, E.J.; Noe, M.C.; Ting, A.Y. *Tetrahedron Lett.*, **1996**, 37, 1735.

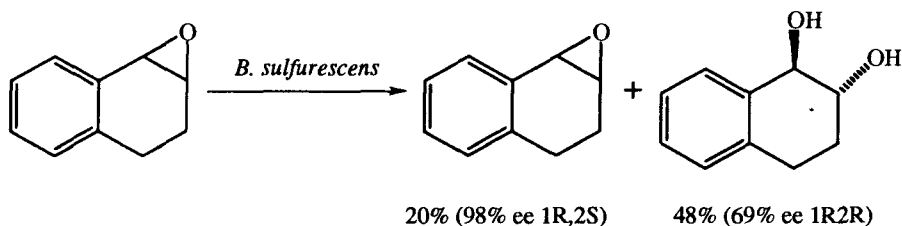
Noe, M.C.; Corey, E.J. *Tetrahedron Lett.*, **1996**, 37, 1739.



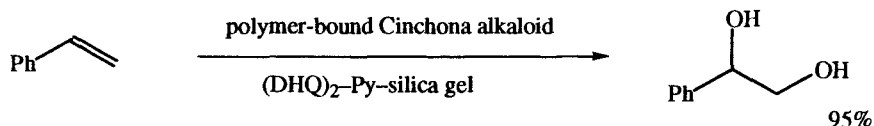
Nomura, R.; Matsuno, T.; Endo, T. *J. Am. Chem. Soc.*, **1996**, 118, 11666.



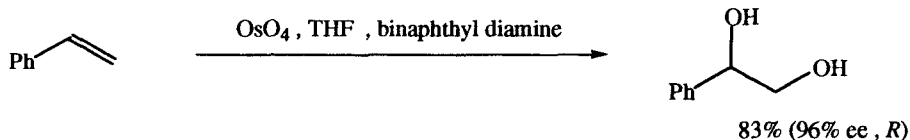
Clerici, A.; Clerici, L.; Porta, O. *Tetrahedron Lett*, **1996**, 37, 3035.



Pedragosa-Moreau, S.; Archlas, A.; Furstoss, R. *Tetrahedron Lett.*, **1996**, 37, 3319.



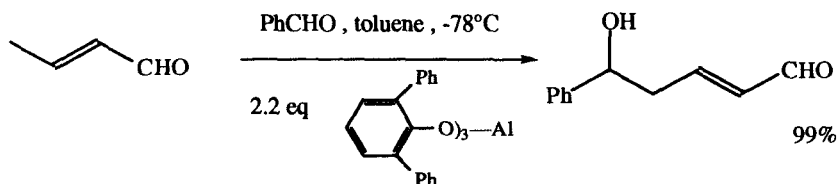
Lohray, B.B.; Nandan, E.; Bhushan, V. *Tetrahedron Asymmetry*, **1996**, 7, 2805.



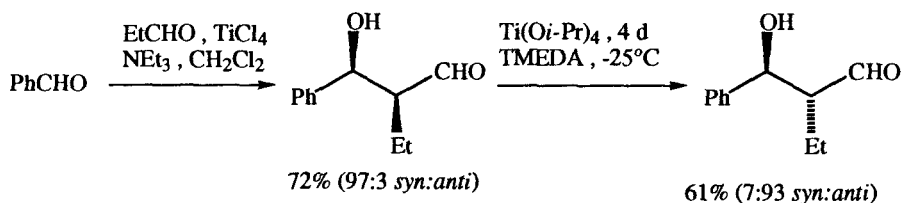
Rosini, C.; Tanturli, R.; Pertici, P.; Salvadori, P. *Tetrahedron Asymmetry*, **1996**, 7, 2971.

Also via: Section 327 (Alcohol - Ester). Section 357 (Ester - Ester).

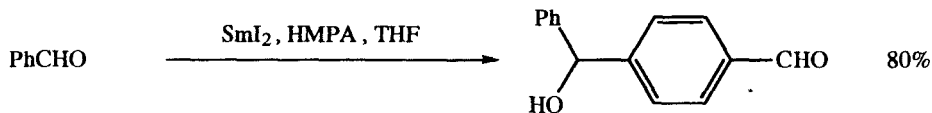
## SECTION 324: ALCOHOL, THIOL - ALDEHYDE



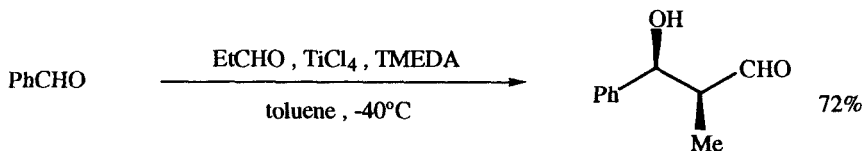
Saito, S.; Shiozawa, M.; Ito, M.; Yamamoto, H. *J. Am. Chem. Soc.*, **1998**, *120*, 813.



Mahrwald, R.; Costisella, B.; Gündogan, B. *Synthesis*, **1998**, 262.



Shiue, J.-S.; Lin, M.-H.; Fang, J.-M. *J. Org. Chem.*, **1997**, *62*, 4643.

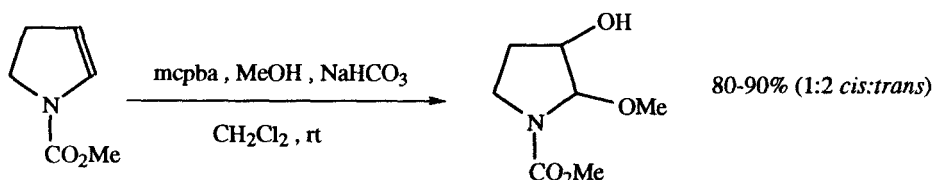


Mahrwald, R.; Costisella, B.; Gündogan, B. *Tetrahedron Lett.*, **1997**, *38*, 4543.

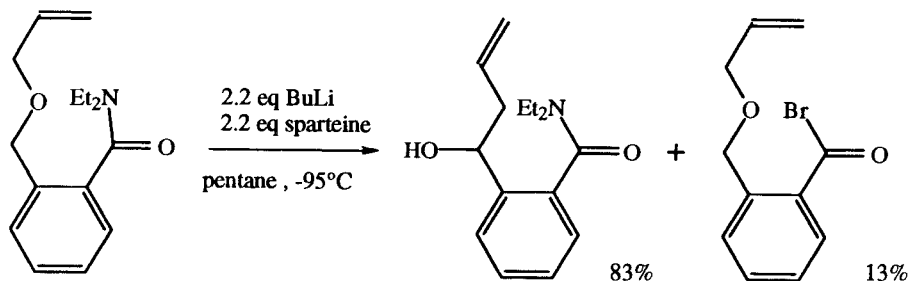
Related Methods:

Section 330 (Alcohol - Ketone).

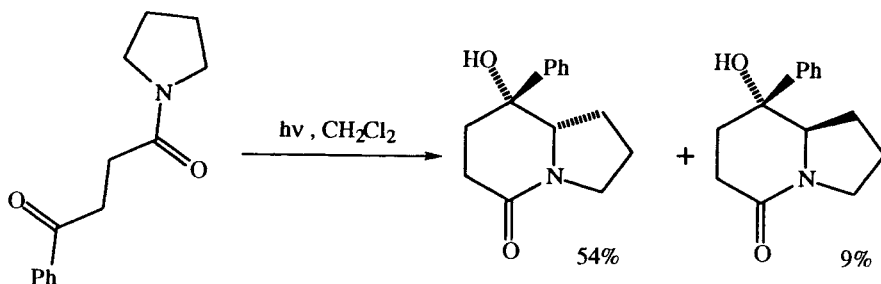
## SECTION 325: ALCOHOL, THIOL - AMIDE



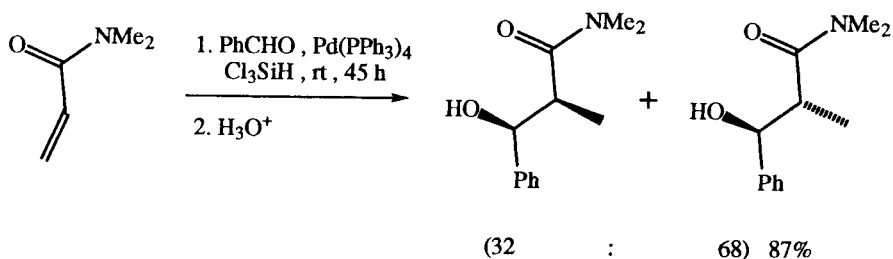
Sugisaki, C.H.; Carroll, P.J.; Correia, C.R.D. *Tetrahedron Lett.*, **1998**, *39*, 3413.



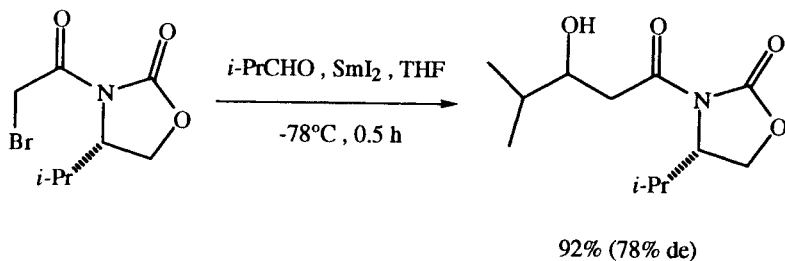
Kawasaki, T.; Kimachi, T. *SynLett*, **1998**, 1429.



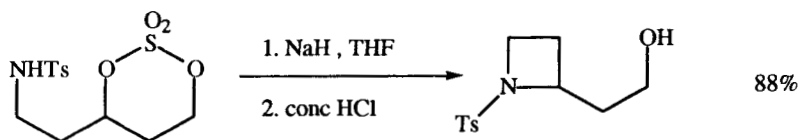
Lindemann, U.; Reck, G.; Wulff-Molder, D.; Wessig, P. *Tetrahedron*, **1998**, 54, 2529.



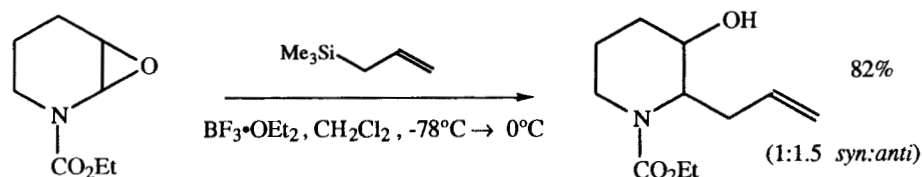
Kiyooka, S.-i.; Shimizu, A.; Torii, S. *Tetrahedron Lett.*, **1998**, 39, 5237.



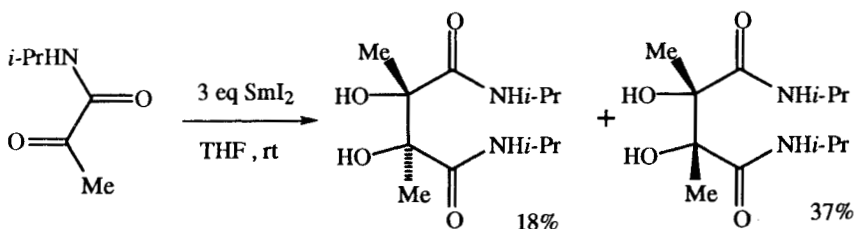
Fukuzawa, S.-i.; Tatsuzawa, M.; Hirano, K. *Tetrahedron Lett.*, **1998**, 39, 6899.



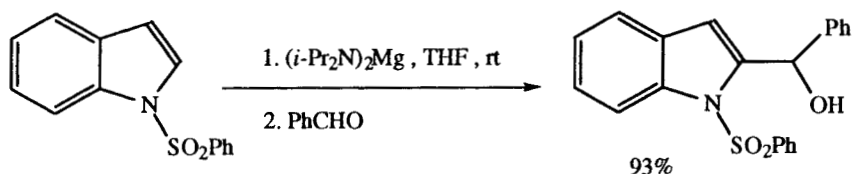
Littler, B.J.; Gallagher, T.; Boddy, I.K.; Riordan, P.D. *SynLett*, **1997**, 22.



Brugess, L.E.; Gross, E.K.M.; Jurka, J. *Tetrahedron Lett.*, **1996**, 37, 3255.

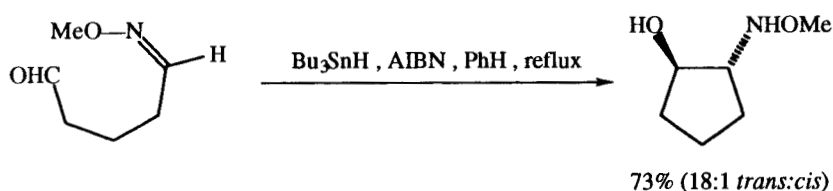


Yamashita, M.; Okuyama, K.; Kawasaki, I.; Ohta, S. *Tetrahedron Lett.*, **1996**, 37, 7755.

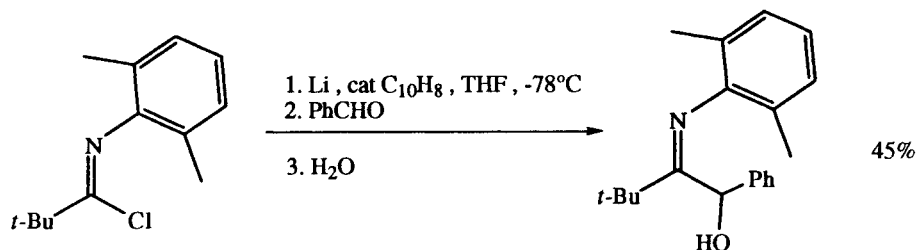


Kondo, Y.; Yoshida, A.; Sakamoto, T. *J. Chem. Soc., Perkin Trans. 1*, **1996**, 2331.

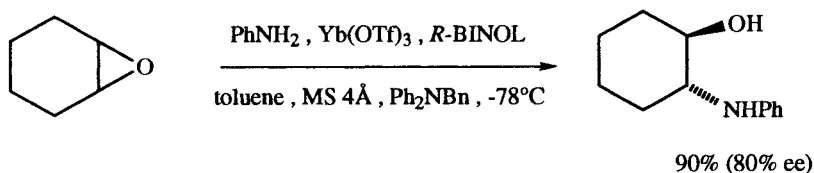
## SECTION 326: ALCOHOL, THIOL - AMINE



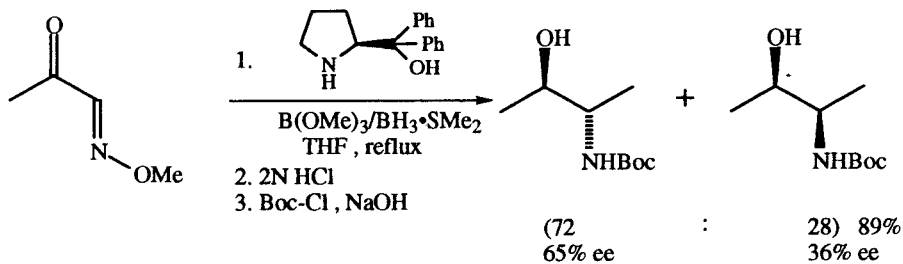
Tormo, J.; Hays, D.S.; Fu, G.C. *J. Org. Chem.*, **1998**, 63, 201.



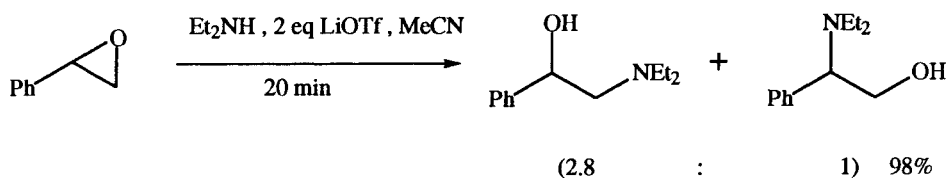
Alonso, E.; Ramón, D.J.; Yus, M. *Tetrahedron*, **1998**, *54*, 12007.



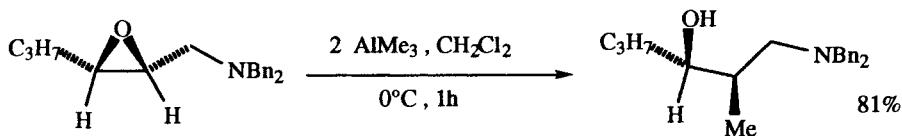
Hou, X.-L.; Wu, J.; Dai, L.-X.; Xia, L.-J.; Tang, M.-H. *Tetrahedron Asymmetry*, **1998**, *9*, 1747.



Masui, M.; Shioiri, T. *Tetrahedron Lett.*, **1998**, *39*, 5193.

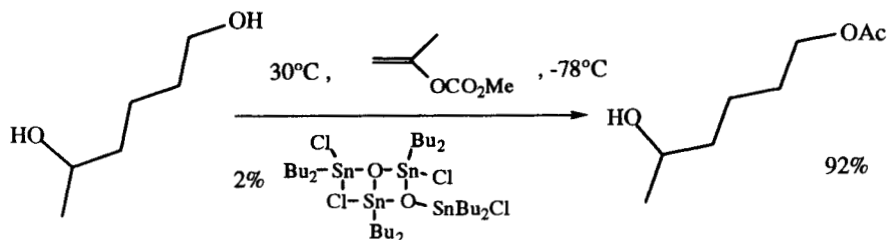


Augé, L.; Leroy, R. *Tetrahedron Lett.*, **1996**, *37*, 7715.

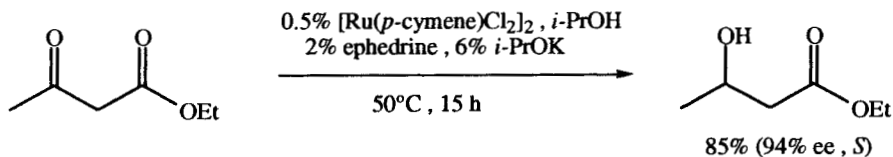


Liu, C.; Hashimoto, Y.; Saigo, K. *Tetrahedron Lett.*, **1996**, *37*, 6177.

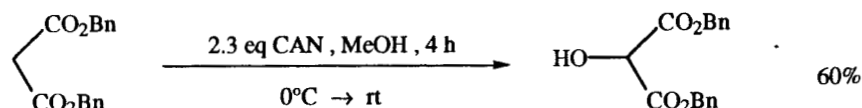
## SECTION 327: ALCOHOL, THIOL - ESTER



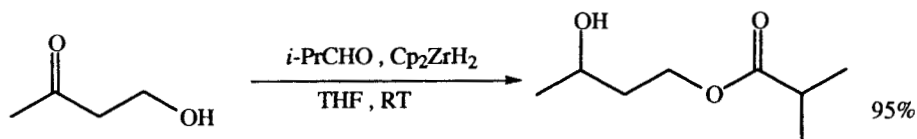
Orita, A.; Mitsutome, A.; Otera, J. *J. Org. Chem.*, **1998**, 63, 2420.



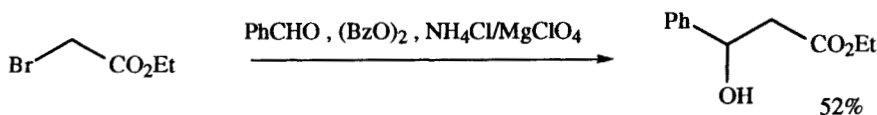
Everaere, K.; Carpentier, J.-E.; Mortreux, A.; Bulliard, M. *Tetrahedron Asymmetry*, **1998**, 9, 2971.



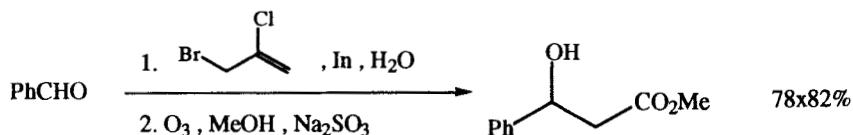
Nair, V.; Nair, L.G.; Mathew, J. *Tetrahedron Lett.*, **1998**, 39, 2801.



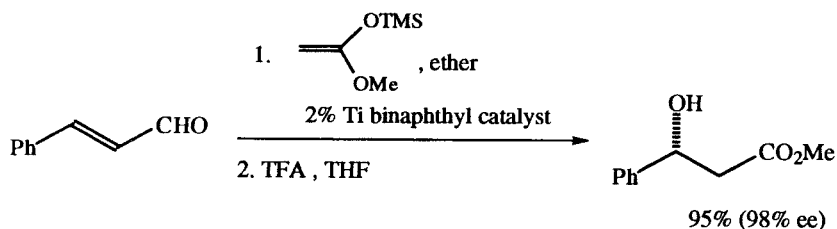
Umekawa, Y.; Sakaguchi, S.; Nishiura, Y.; Ishii, Y. *J. Org. Chem.*, **1997**, 62, 3409.



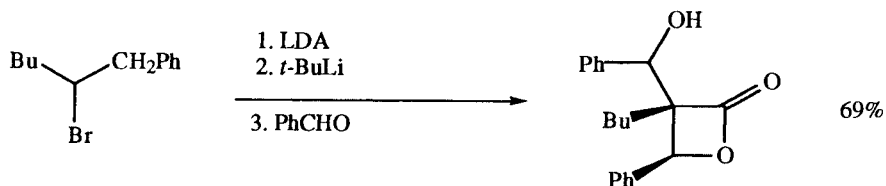
Bieber, L.W.; Malvestiti, I.; Storch, E.C. *J. Org. Chem.*, **1997**, 62, 904.



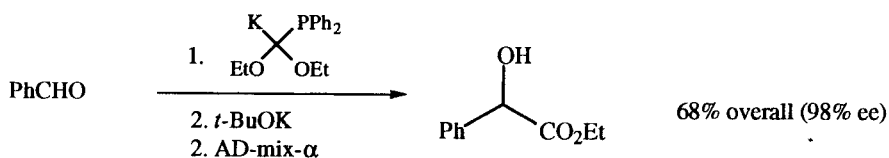
Yi, X.-H.; Meng, Y.; Li, C.-J. *Tetrahedron Lett.*, **1997**, 38, 4731.



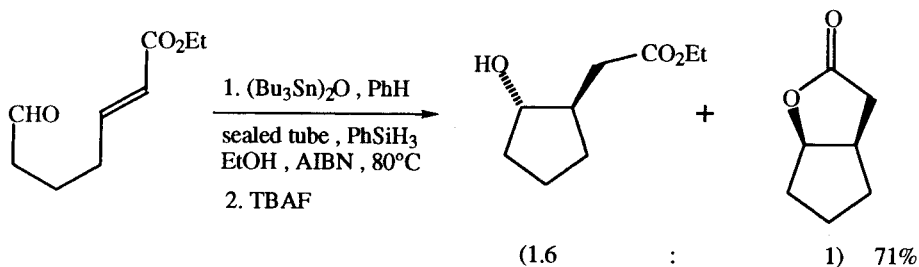
Singer, R.A.; Carreira, E.M. *Tetrahedron Lett.*, **1997**, 38, 927.



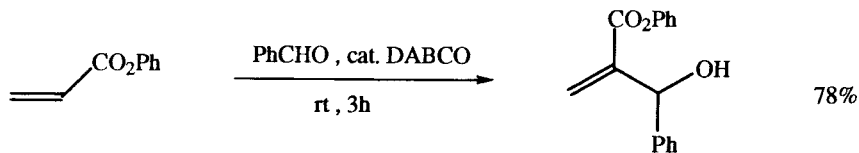
Shindo, M. *Tetrahedron Lett.*, **1997**, 38, 4433.



Kirschning, A.; Dräger, G.; Jung, A. *Angew. Chem. Int. Ed.*, **1997**, 36, 253.

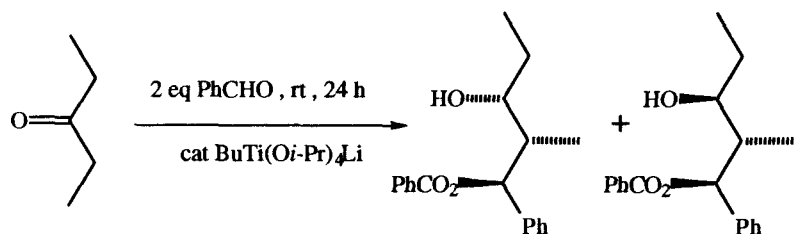


Hays, D.S.; Fu, G.C. *J. Org. Chem.*, **1996**, 61, 4.

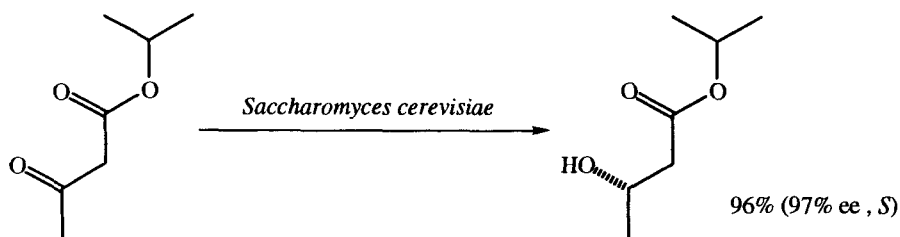
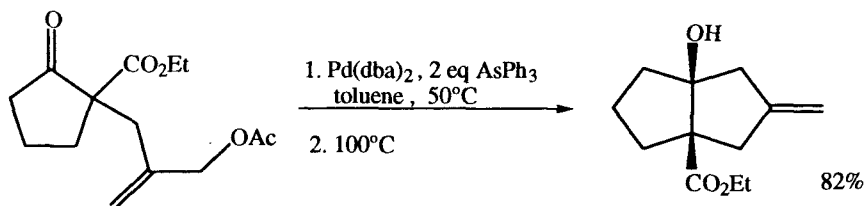
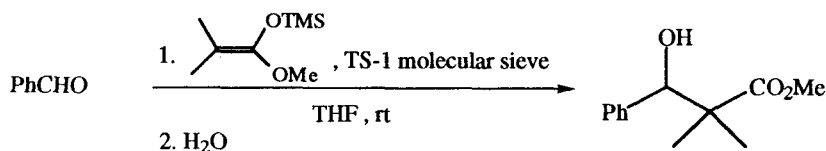


Perlmutter, P.; Puniani, E.; Westman, G. *Tetrahedron Lett.*, **1996**, 37, 1715.





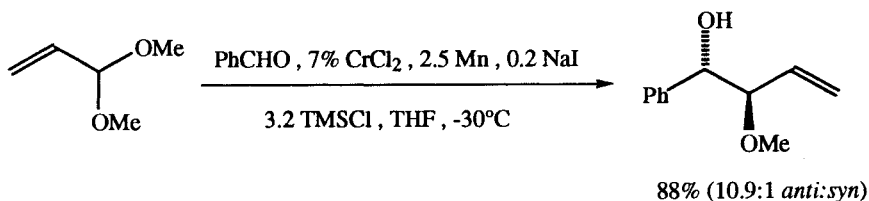
(99 : 1) 63%

Mahrwald, R.; Costisella, B. *Synthesis*, **1996**, 1087.Medson, C.; Smallridge, A.J.; Trehwella, M.A. *Tetrahedron Asymmetry*, **1997**, 8, 1049.Ahiko, T.-a.; Ishiyama, T.; Miyara, N. *Chem. Lett*, **1997**, 811.

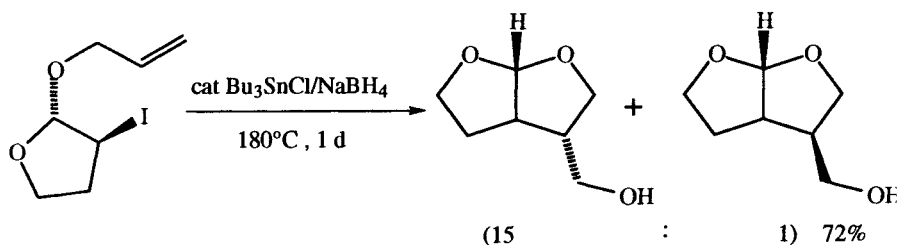
85%

Sasidharan, M.; Raju, S.V.N.; Srinivasan, K.V.; Paul, V.; Kumar, R. *Chem. Lett.*, **1996**, 129

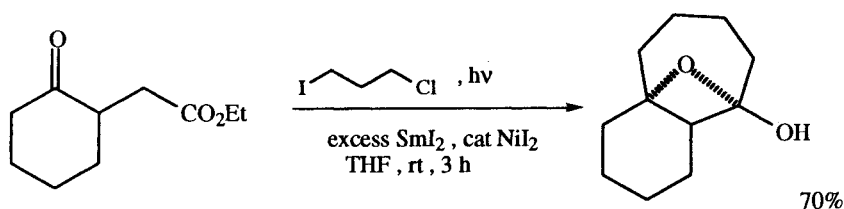
Also via: Section 313 (Alcohol - Carboxylic Acid).

**SECTION 328: ALCOHOL, THIOL - ETHER, EPOXIDE, THIOETHER**


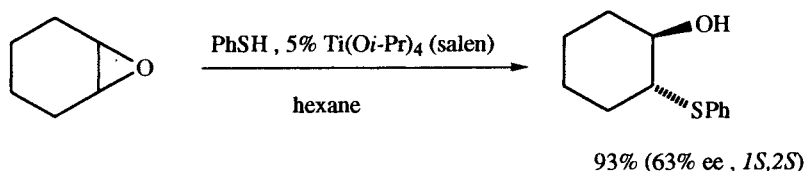
Boeckman Jr., R.K.; Hudack Jr., R.A. *J. Org. Chem.*, **1998**, *63*, 3524.



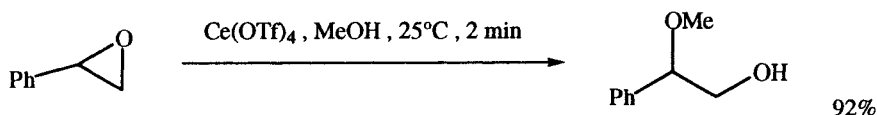
Mayer, S.; Prandi, L.; Bamhaoud, T.; Bakkas, S.; Guillou, O. *Tetrahedron*, **1998**, *54*, 8753.



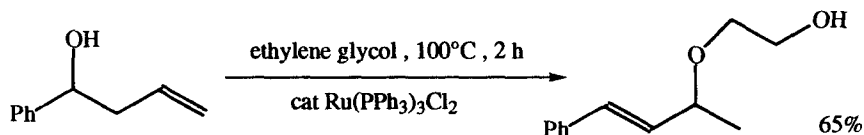
Molander, G.A.; Sono, M. *Tetrahedron*, **1998**, *54*, 9289.



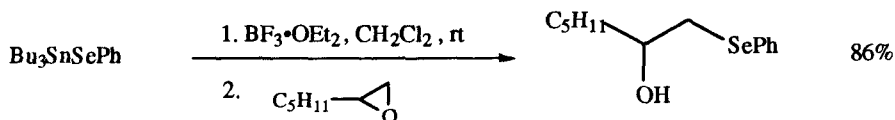
Wu, J.; Hou, X.-L.; Dai, L.-X.; Xia, J.-J.; Tang, M.-H. *Tetrahedron Asymmetry*, **1998**, *9*, 3431.



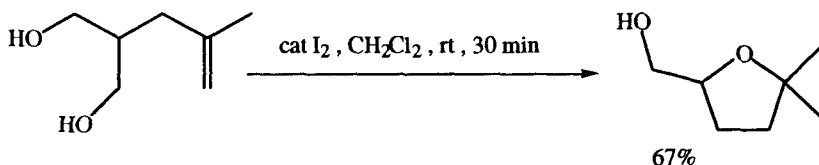
Iranpoor, N.; Shekarriz, M.; Shiring, F. *Synth. Commun.*, **1998**, *28*, 347.



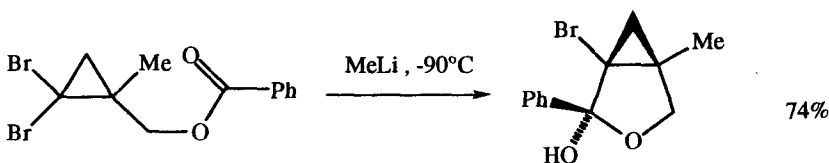
Wang, D.; Li, C.-J. *Synth. Commun.*, **1998**, 28, 507.



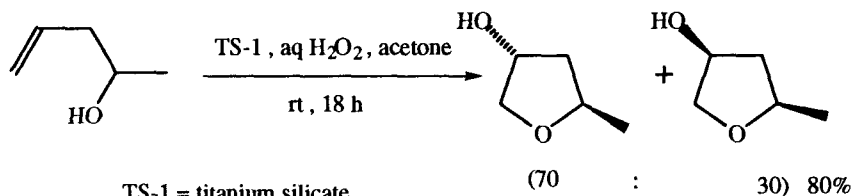
Nishiyama, Y.; Ohashi, H.; Itoh, K.; Sonoda, N. *Chem. Lett.*, **1998**, 159.



Kim, K.M.; Jeon, D.J.; Ryu, E.K. *Synthesis*, **1998**, 835.

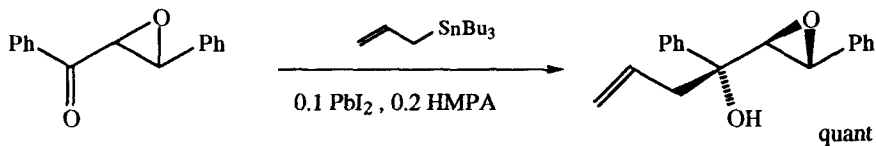


Baird, M.S.; Huber, F.A.M. *Tetrahedron Lett.*, **1998**, 39, 9081.

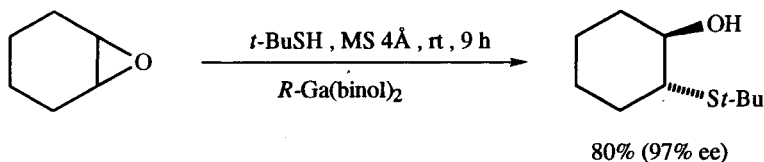


TS-1 = titanium silicate

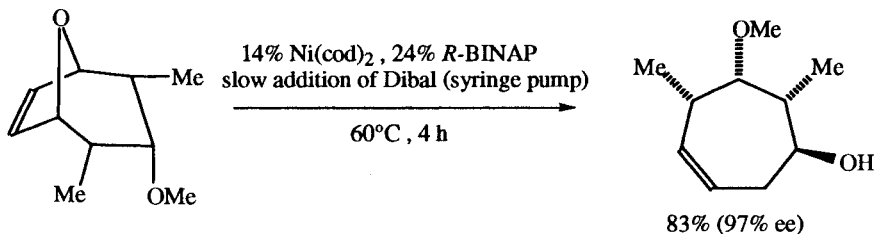
Bhaumik, A.; Tatsumi, T. *Chem. Commun.*, **1998**, 463.



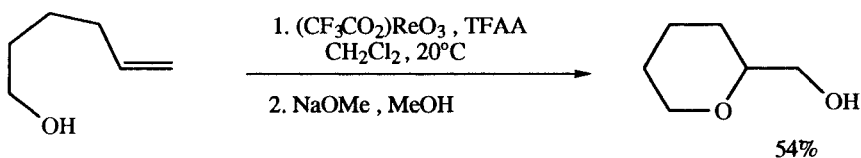
Shibata, I.; Fukuoka, S.; Yoshimura, N.; Matsuda, H.; Baba, A. *J. Org. Chem.*, **1997**, 62, 3790.



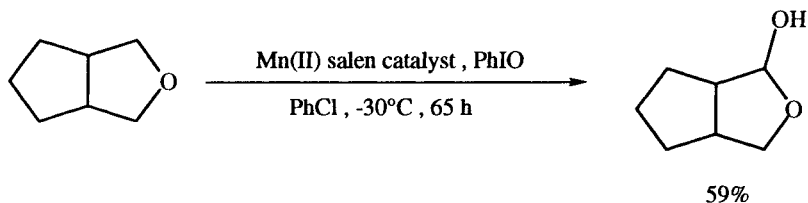
Iida, T.; Yamamoto, N.; Sasai, H.; Shibasaki, M. *J. Am. Chem. Soc.*, **1997**, *119*, 4783.



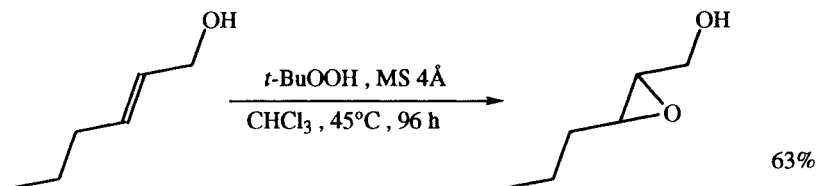
Lautens, M.; Rovis, T. *J. Am. Chem. Soc.*, **1997**, *119*, 11090.



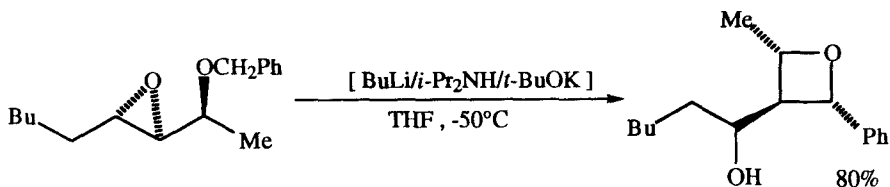
McDonald, F.E.; Singhi, A.D. *Tetrahedron Lett.*, **1997**, *38*, 7683.



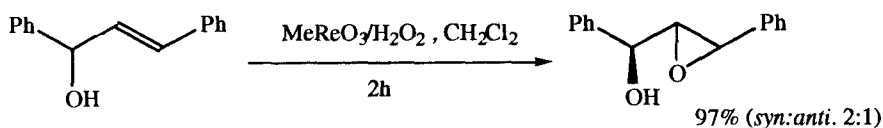
Miyafuji, A.; Katsuki, T. *SynLett*, **1997**, 836.



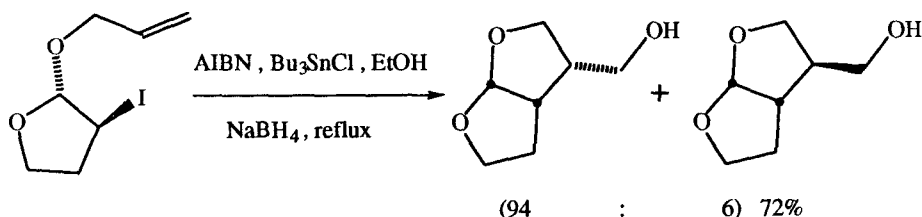
Palombi, L.; Bonadies, F.; Scettri, A. *Tetrahedron*, **1997**, *53*, 11369.



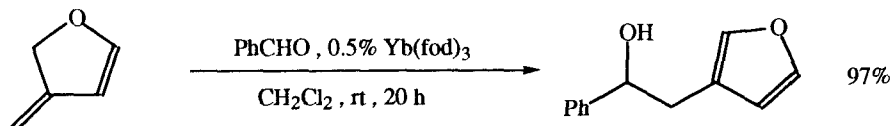
Mordini, A.; Bindi, S.; Pecchi, S.; Capperucci, A.; Degl'Innocenti, A.; Reginato, G. *J. Org. Chem.*, **1996**, *61*, 4466.



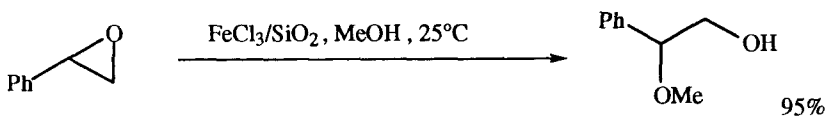
Boehlow, T.R.; Spinning, C.D. *Tetrahedron Lett.*, **1996**, *37*, 2717.



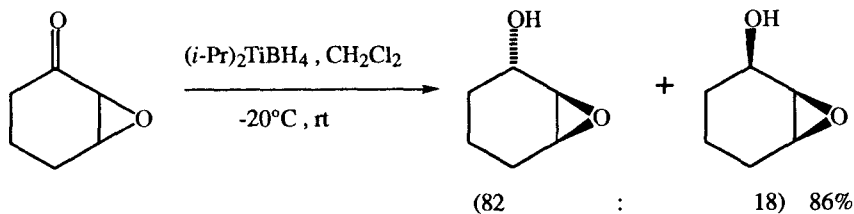
Mayer, S.; Prandi, J. *Tetrahedron Lett.*, **1996**, *37*, 3117.



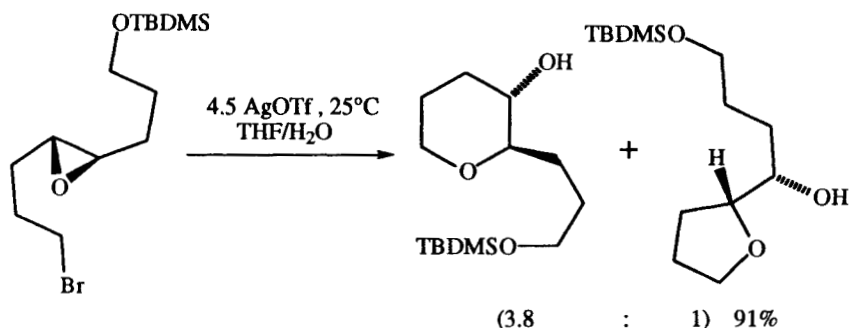
Miles, W.H.; Berreth, C.L.; Anderton, C.A. *Tetrahedron Lett.*, **1996**, *37*, 7893.



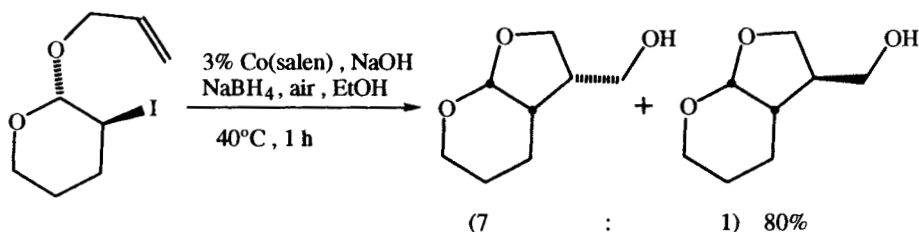
Iranpoor, N.; Tarrian, T.; Movahedi, Z. *Synthesis*, **1996**, 1473.



Ravikumar, K.S.; Chandrasekaran, S. *Tetrahedron*, **1996**, *52*, 9137.

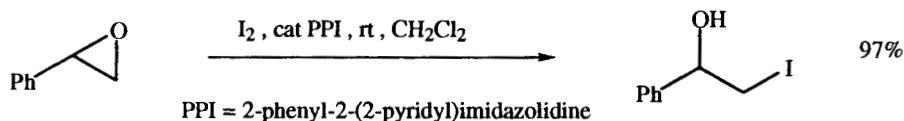


Hayashi, N.; Hujawara, K.; Murai, A. *Chem. Lett.*, **1996**, 341.

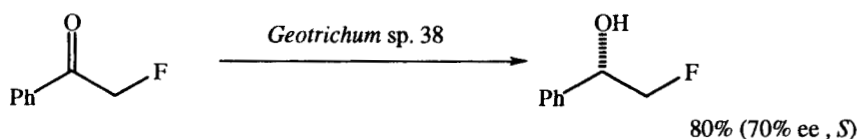


Bamhaoud, T.; Prandi, J. *Chem. Commun.*, **1996**, 1229.

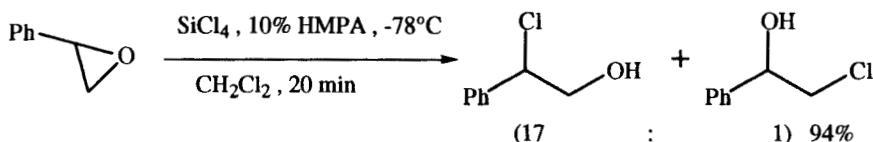
## SECTION 329: ALCOHOL, THIOL - HALIDE, SULFONATE



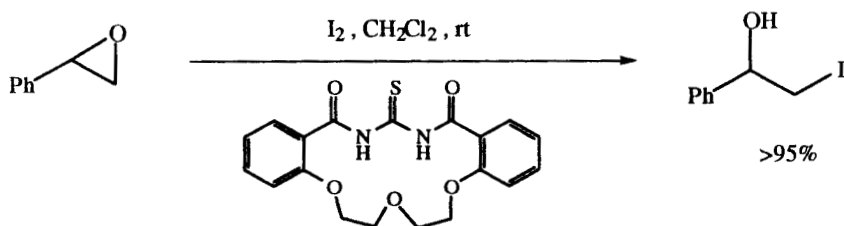
Sharghi, H.; Naeimi, H. *SynLett*, **1998**, 1343.



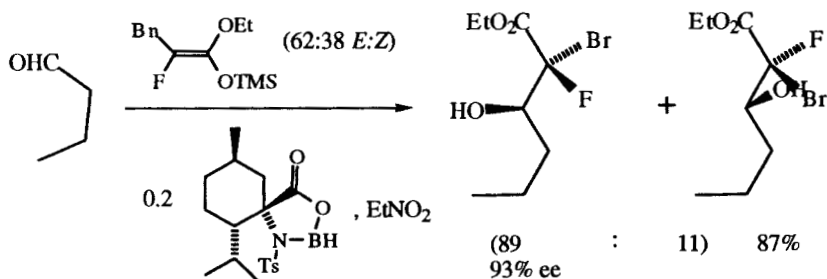
Wei, Z.-L.; Li, Z.-Y.; Lin, G.-Q. *Tetrahedron*, **1998**, 54, 13059.



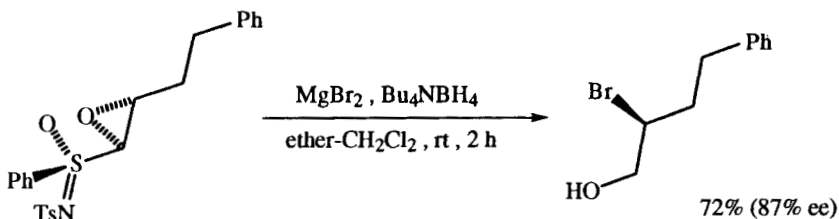
Denmark, S.E.; Barsanti, P.A.; Wong, K.-T.; Stavenger, R.A. *J. Org. Chem.* **1998**, 63, 2428



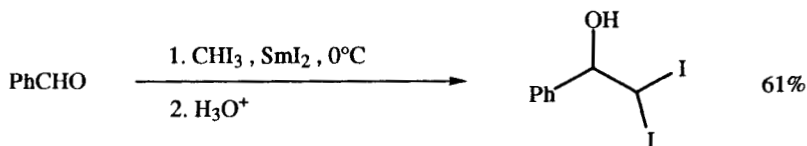
Sarghi, H.; Massah, A.R.; Eshghi, H.; Niknam, K. *J. Org. Chem.*, **1998**, 63, 1455.



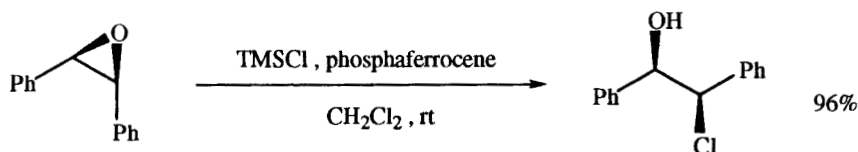
Iseki, K.; Kuroki, Y.; Kobayashi, Y. *SynLett*, **1998**, 437.



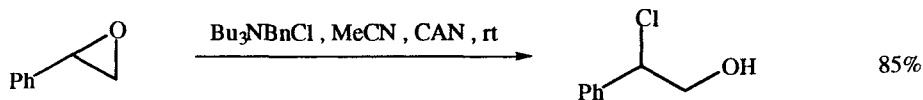
Bailey, P.L.; Briggs, A.D.; Jackson, R.F.W.; Pietruszka, J. *J. Chem. Soc., Perkin Trans. 1*, **1998**, 3359.



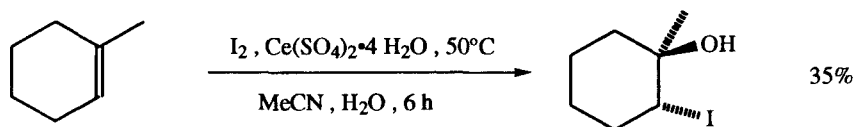
Concellón, J.M.; Bernad, P.L.; Perez-Andrés, J.A. *Tetrahedron Lett.*, **1998**, 39, 1409.



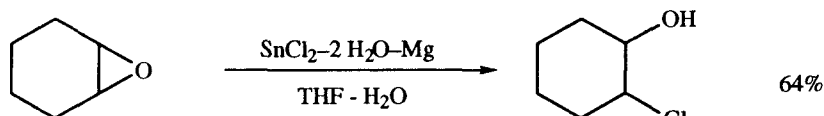
Garrett, C.E.; Fu, G.C. *J. Org. Chem.*, **1997**, 62, 4534.



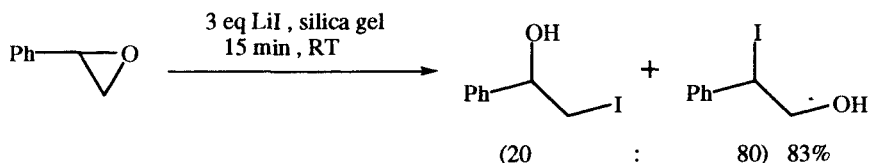
Iranpoor, N.; Kazemi, F.; Salehi, P. *Synth. Commun.*, **1997**, 37, 1247.



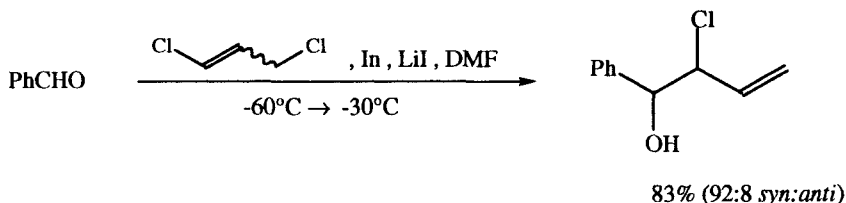
Horiuchi, C.A.; Ikeda, A.; Kanamori, M.; Hosokawa, H.; Sugiyama, T.; Takahashi, T.T. *J. Chem. Res. (S)*, **1997**, 60.



Sarangi, C.; Das, N.B.; Nanda, B.; Nayak, A.; Sharma, R.P. *J. Chem. Res. (S)*, **1997**, 180.

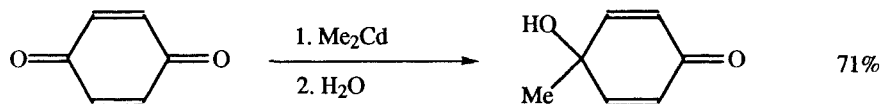


suki, H.; Shimanduchi, T. *Tetrahedron Lett.*, **1996**, 36, 1845.



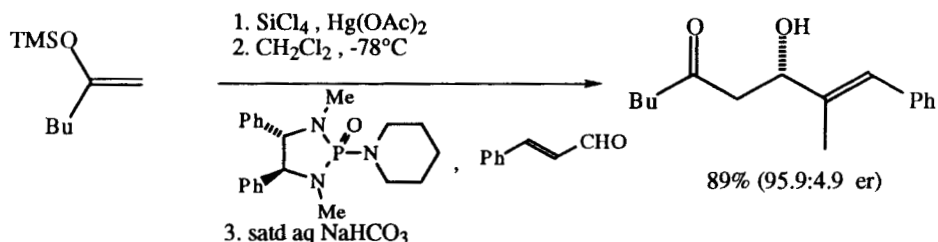
Araki, S.; Hirashita, T.; Shimizu, H.; Yamamura, H.; Kawai, M.; Butsugan, Y. *Tetrahedron Lett.*, **1996**, 37, 8417.

## SECTION 330: ALCOHOL, THIOL - KETONE

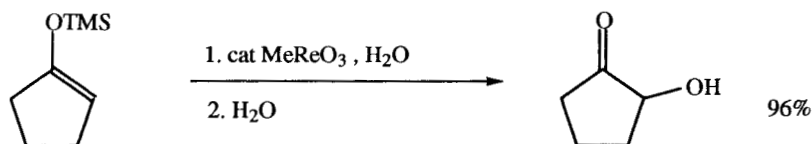


Aponick, A.; McKinley, J.D.; Raber, J.C.; Wigal, C.T. *J. Org. Chem.*, **1998**, 63, 2676.

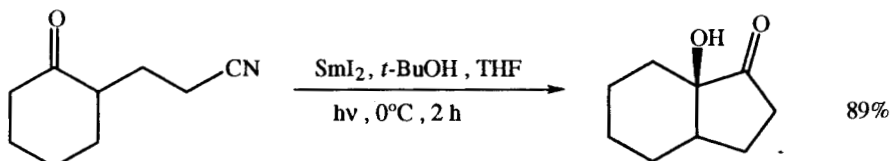




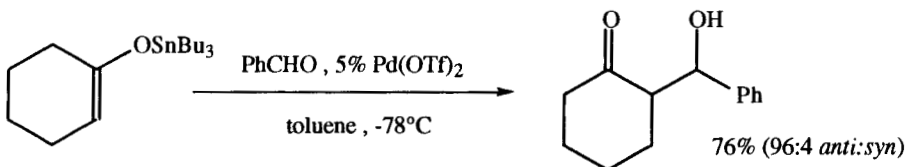
**Denmark, S.E.;** Stavenger, R.A.; Wong, K.-T. *J. Org. Chem.*, **1998**, 63, 918.



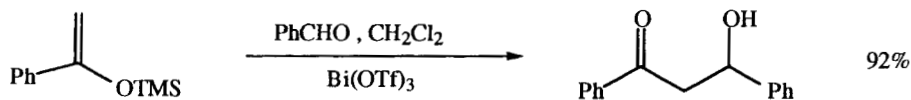
**Stanković, S.;** Espenson, J.H. *J. Org. Chem.*, **1998**, 63, 4129.



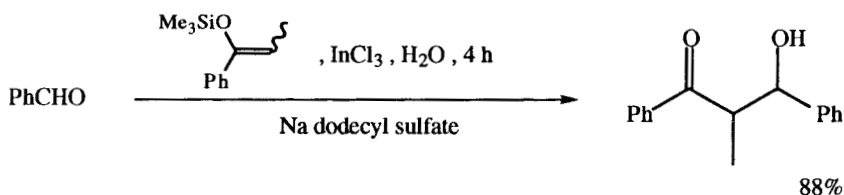
**Molander, G.A.;** Wolfe, C.N. *J. Org. Chem.*, **1998**, 63, 9031.



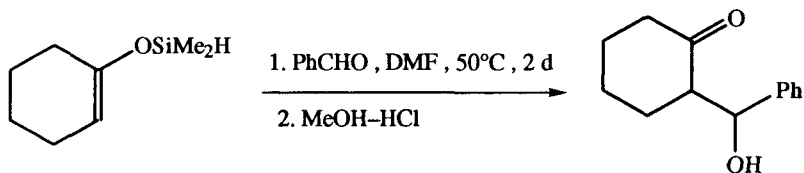
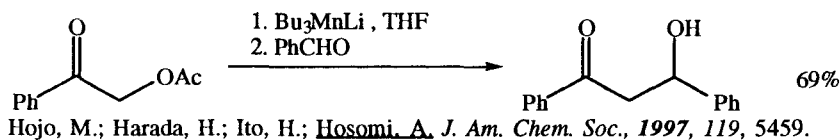
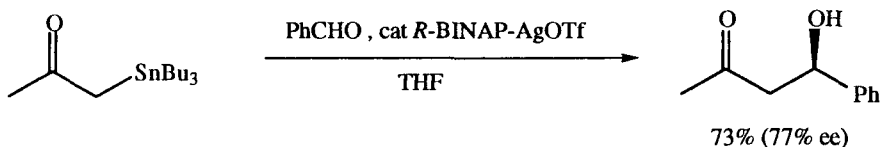
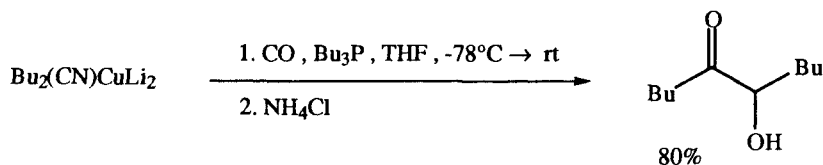
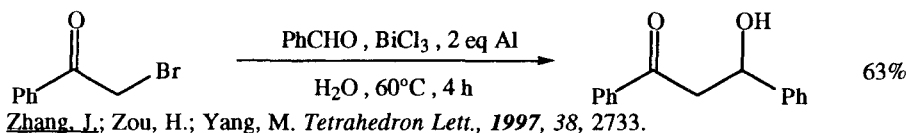
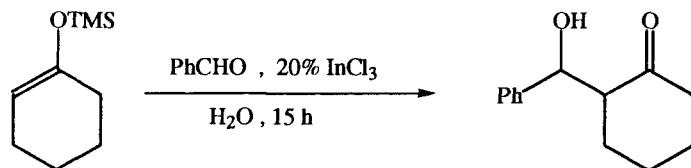
**Yanagisawa, A.;** Kimura, K.; Nakatsuka, Y.; **Yamamoto, H.** *SynLett*, **1998**, 958.

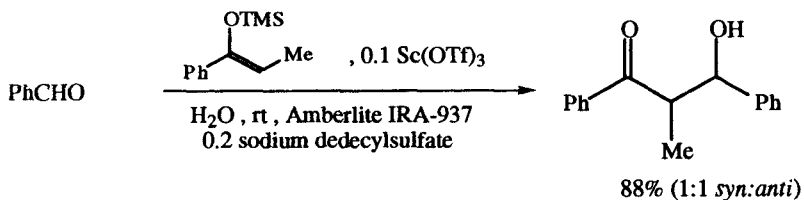


**LeRaex, C.;** Ciliberti, L.; Laurent-Robert, H.; Laporerie, A.; **Dubac, J.** *SynLett*, **1998**, 1249.

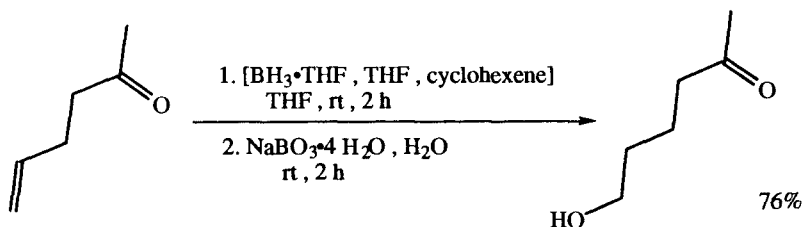


**Kobayashi, S.;** Busujima, T.; Nagayama, S. *Tetrahedron Lett.*, **1998**, 39, 1579.

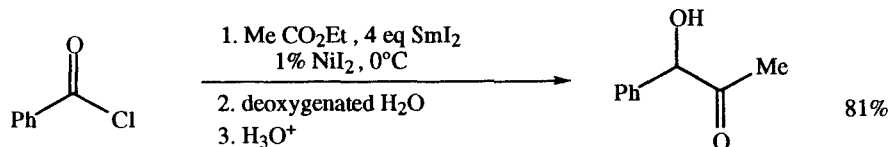
79% (58:42 *syn:anti*)Miura, K.; Sato, H.; Tamaki, K.; Ito, H.; Hosomi, A. *Tetrahedron Lett.*, **1998**, 39, 2585.Hojo, M.; Harada, H.; Ito, H.; Hosomi, A. *J. Am. Chem. Soc.*, **1997**, 119, 5459.Yanigisawa, A.; Matsumoto, Y.; Nakashima, H.; Asakawa, K.; Yamamoto, H.  
*J. Am. Chem. Soc.*, **1997**, 119, 9319.Kabalka, G.W.; Lin, N.-S.; Yu, S. *Tetrahedron Lett.*, **1997**, 38, 2203.Zhang, J.; Zou, H.; Yang, M. *Tetrahedron Lett.*, **1997**, 38, 2733.51% (48:52 *anti:syn*)Loh, T.-P.; Pei, J.; Koh, K.S.-V.; Cao, G.-Q.; Li, X.-R. *Tetrahedron Lett.*, **1997**, 38, 3465



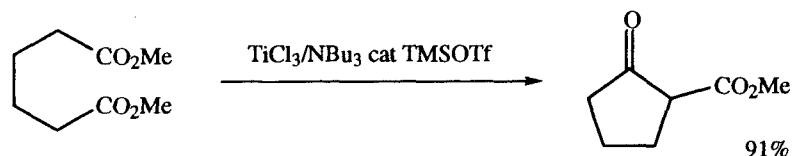
Kobayashi, S.; Wakabayashi, T.; Nagayama, S.; Oyamada, H.  
*Tetrahedron Lett.*, **1997**, 38, 4559.



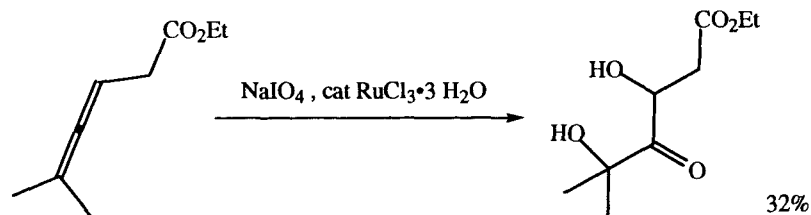
Kabalka, G.W.; Yu, S.; Li, N.-S. *Tetrahedron Lett.*, **1997**, 38, 5455.



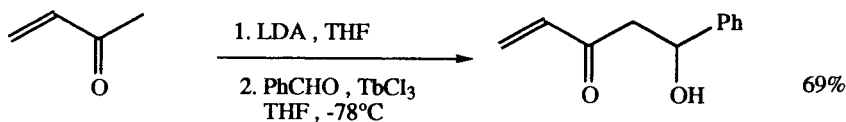
Machrouhi, F.; ~~Namy, J.-L.~~; Kagan, H.B. *Tetrahedron Lett.*, **1997**, 38, 7183.



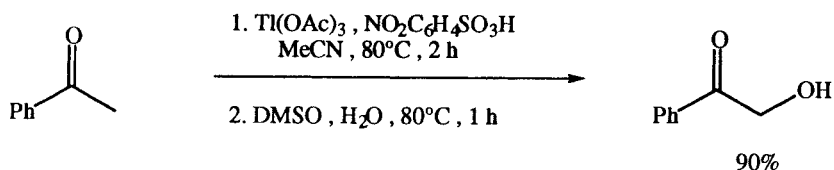
Yoshida, Y.; Hayashi, R.; Sumihara, H.; ~~Tanabe, Y.~~ *Tetrahedron Lett.*, **1997**, 38, 8727.



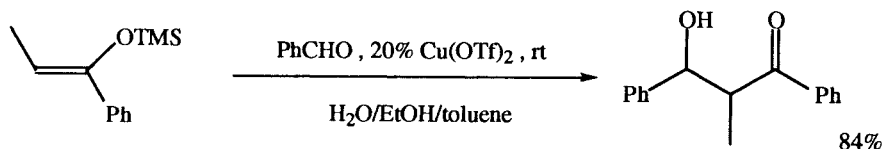
Laux, M.; ~~Krause, N.~~ *SynLett.*, **1997**, 765.



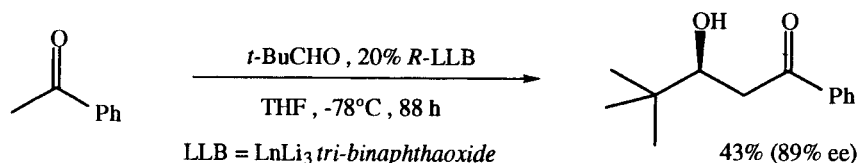
Hong, B.-C.; Chin, S.-F. *Synth. Commun.*, **1997**, 27, 1191.



Lee, J.C.; Park, C.; Choi, Y. *Synth. Commun.*, **1997**, 27, 4079.

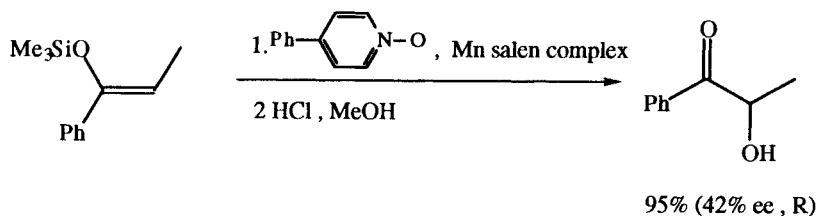


Kobayashi, S.; Nagayama, S.; Busujima, T. *Chem. Lett.*, **1997**, 959.

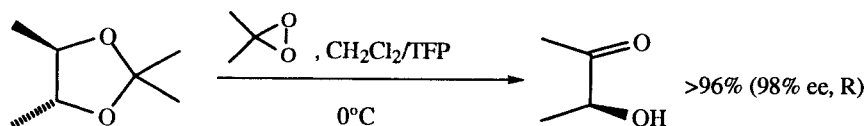


LLB = LnLi<sub>3</sub> tri-binaphthoxide

Yamada, Y.M.A.; Yoshikawa, N.; Sasai, H.; Shibasaki, M. *Angew. Chem. Int. Ed.*, **1997**, 36, 1871.

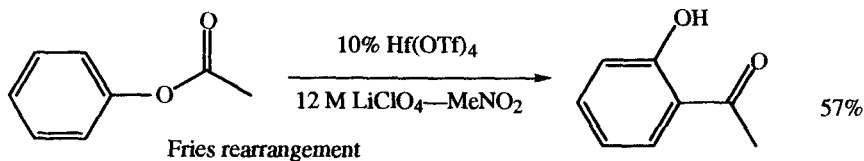


Adam, W.; Fell, R.T.; Mock-Knoblauch, C.; Saha-Möller, C.R. *Tetrahedron Lett.*, **1996**, 37, 6531.

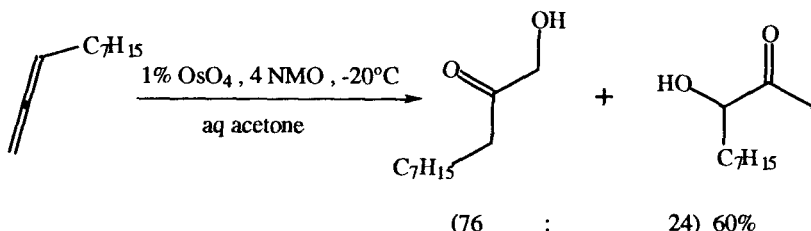


TFP = 1,1,1-trifluoro-2-propanone

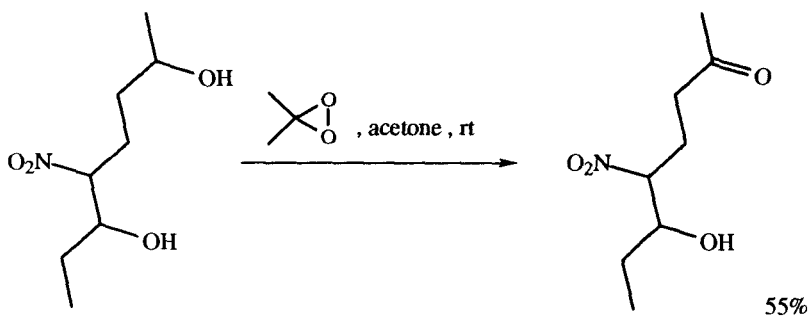
Curci, R.; D'Accolti, L.; Dinoi, A.; Fusco, C.; Rosa, A. *Tetrahedron Lett.*, **1996**, 37, 115.



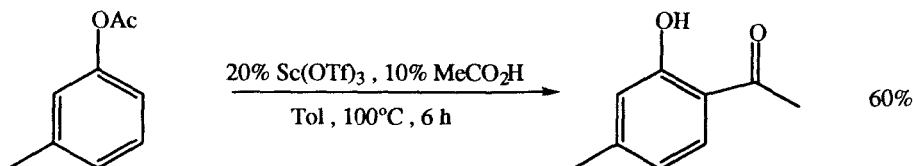
Kobayashi, S.; Moriwaki, M.; Hachiya, I. *Tetrahedron Lett.*, **1996**, 37, 2053.



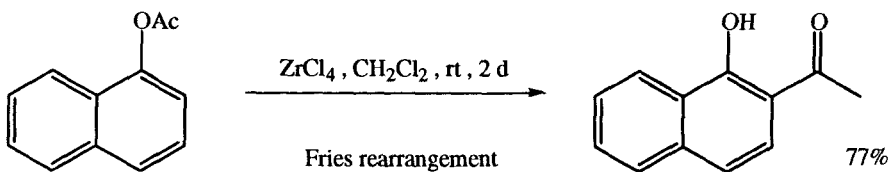
David, K.; Ariento, C.; Greiner, A.; Goré, J.; Cazes, B. *Tetrahedron Lett.*, **1996**, 37, 3335.



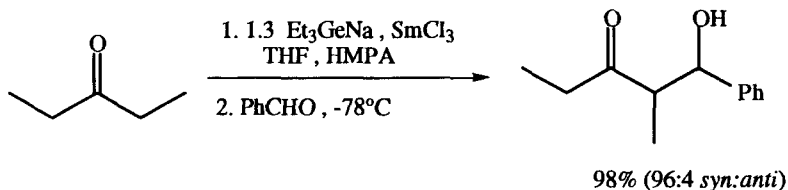
Ballini, R.; Papa, F.; Bovicelli, P. *Tetrahedron Lett.*, **1996**, 37, 3507.



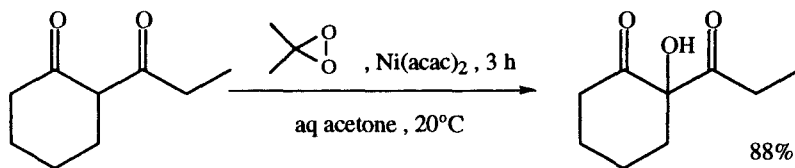
Kobayashi, S.; Moriwaki, M.; Hachiya, I. *Tetrahedron Lett.*, **1996**, 37, 4183.



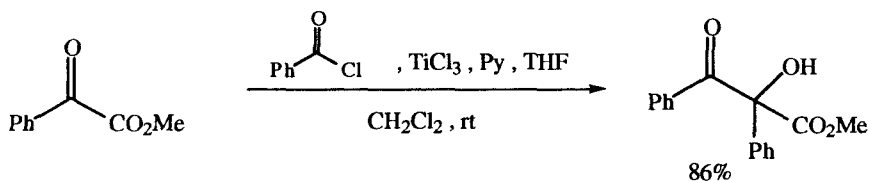
Harrowven, D.C.; Dainty, R.F. *Tetrahedron Lett.*, **1996**, 37, 7659.



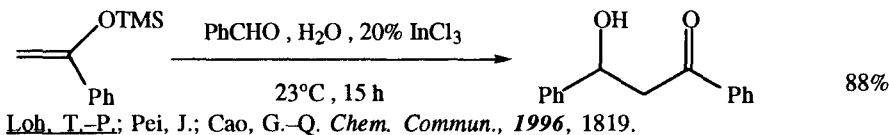
Yokoyama, Y.; Mochida, K. *SynLett*, **1996**, 445.



Adam, W.; Smerz, A.K. *Tetrahedron*, **1996**, 52, 5799.

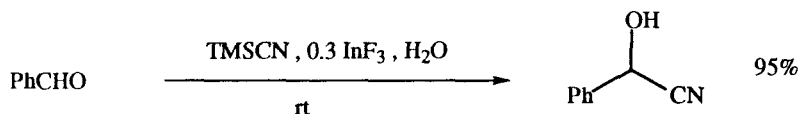


Clerici, A.; Clerici, L.; Porta, O. *Tetrahedron*, **1996**, 52, 11037.

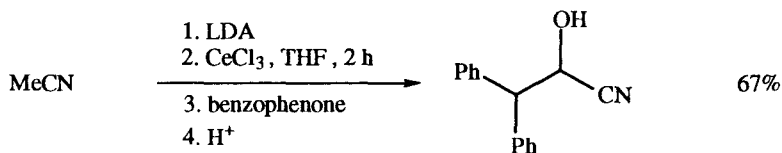


Loh, T.-P.; Pei, J.; Cao, G.-Q. *Chem. Commun.*, **1996**, 1819.

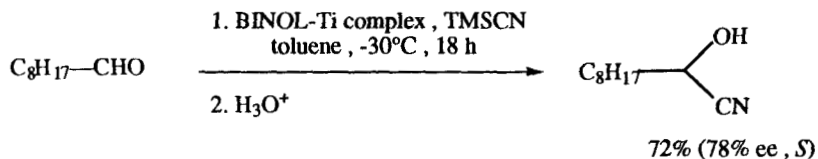
## SECTION 331: ALCOHOL, THIOL - NITRILE



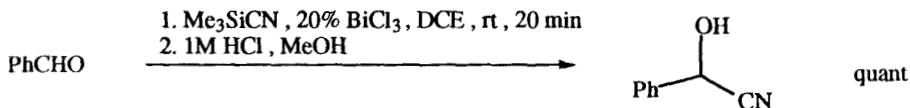
Loh, T.-P.; Xu, K.-C.; Ho, D.S.-C.; Sim, K.-Y. *SynLett*, **1998**, 369.



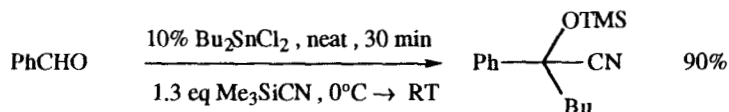
Xiao, Z.; Timberlake, J.W. *Tetrahedron*, **1998**, 54, 4211.



Mori, M.; Imma, H.; Nakai, T. *Tetrahedron Lett.*, **1997**, 38, 6229.



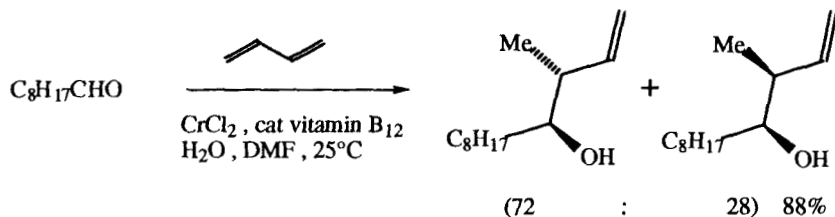
Wada, M.; Takahashi, T.; Domae, T.; Fukuma, T.; Miyoshi, N.; Smith, K. *Tetrahedron Asymmetry*, **1997**, 8, 3939.



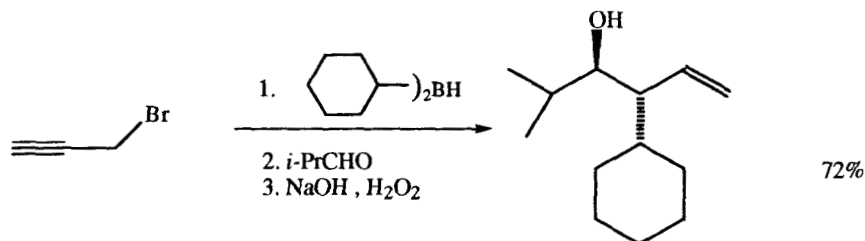
Whitesell, J.K.; Apodaca, R. *Tetrahedron Lett.*, **1996**, 37, 2525.

## SECTION 332: ALCOHOL, THIOL - ALKENE

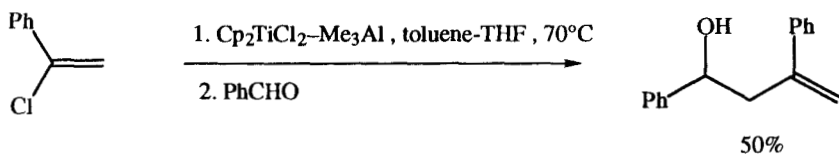
Allylic and benzylic hydroxylation ( $\text{C}=\text{C}-\text{C}-\text{H} \rightarrow \text{C}=\text{C}-\text{C}-\text{OH}$ , etc.) is listed in Section 41 (Alcohols from Hydrides).



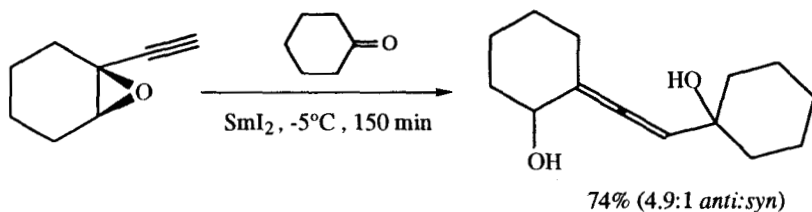
Takai, K.; Toratsu, C. *J. Org. Chem.*, **1998**, 63, 6450.



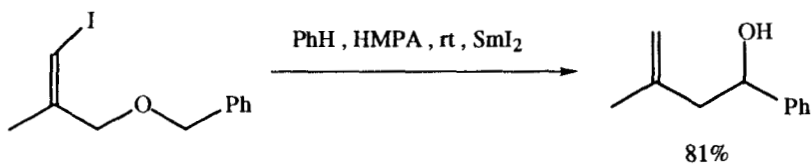
Gaddoni, L.; Lombardo, M.; Trombini, C. *Tetrahedron Lett.*, **1998**, 39, 7571.



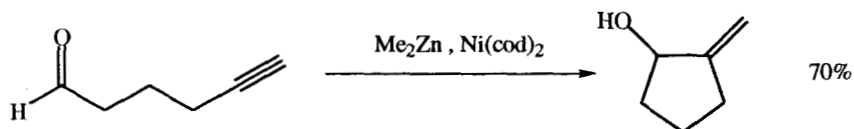
Hanzawa, Y.; Kowase, N.; Taguchi, T. *Tetrahedron Lett.*, **1998**, 39, 583.



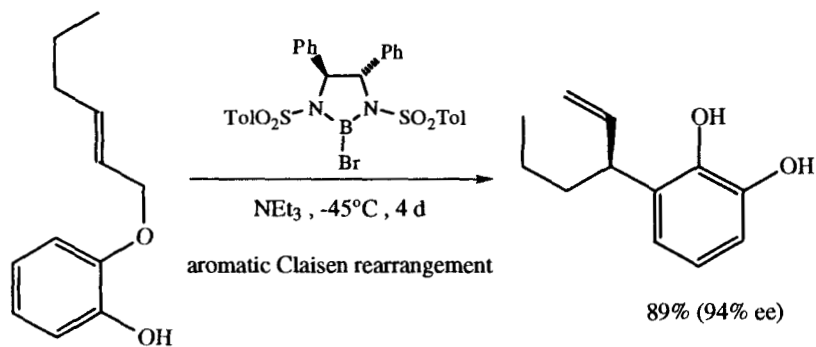
Aurrecoechea, J.M.; Alonso, E.; Solay, M. *Tetrahedron*, **1998**, 54, 3833.



Kunishima, M.; Hioki, K.; Kono, K.; Kato, A.; Tani, S. *J. Org. Chem.*, **1997**, 62, 7542.

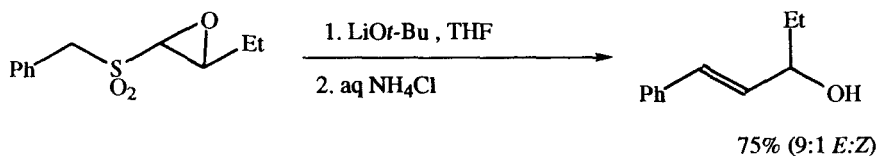


Oblinger, E.; Montgomery, J. *J. Am. Chem. Soc.*, **1997**, 119, 9065.

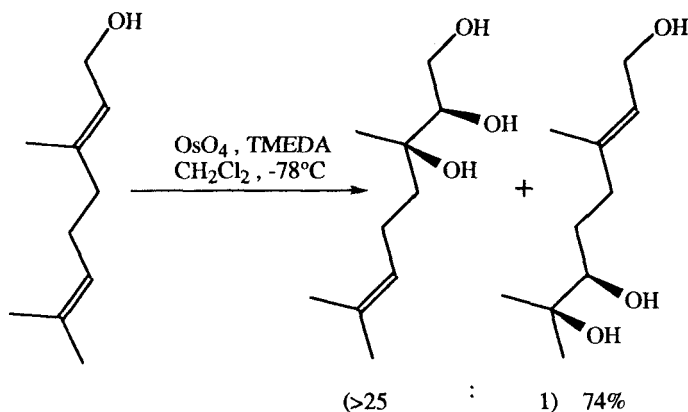


Ito, H.; Sato, A.; Taguchi, T. *Tetrahedron Lett.*, **1997**, 38, 4815.

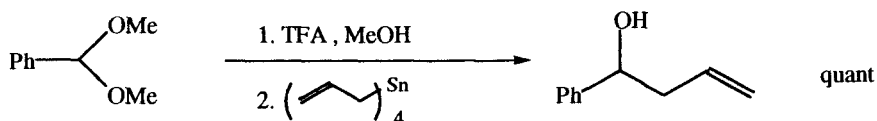




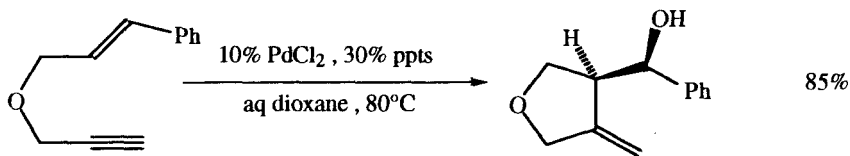
Evans, P.; Taylor, R.J.K. *Tetrahedron Lett.*, **1997**, 38, 3055.



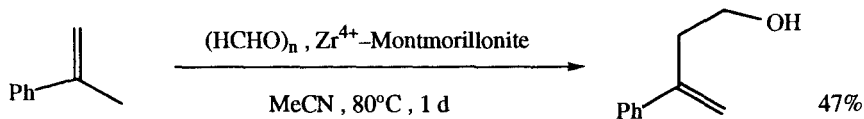
Donohoe, T.J.; Moore, P.R.; Waring, M.J.; Newcombe, N.J. *Tetrahedron Lett.*, **1997**, 38, 5027



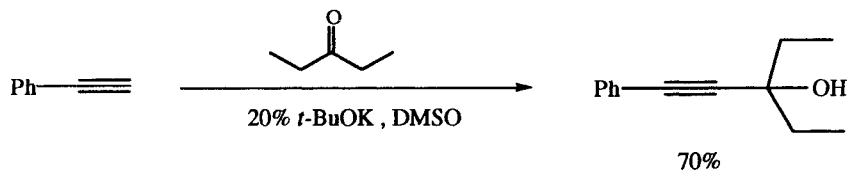
McCluskey, A.; Mayer, D.M.; Young, D.J. *Tetrahedron Lett.*, **1997**, 38, 5217.



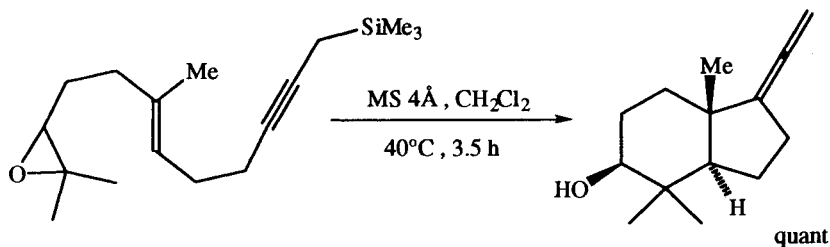
Galland, J.-C.; Savignac, M.; Genêt, L.-P. *Tetrahedron Lett.*, **1997**, 38, 8695.



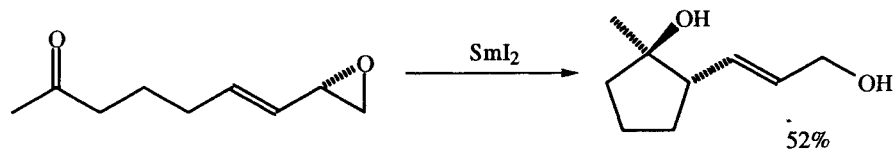
Tateiwa, J.-i.; Kimura, A.; Takasuka, M.; Uemura, S.  
*J. Chem. Soc., Perkin Trans. 1.* **1997**, 2169.



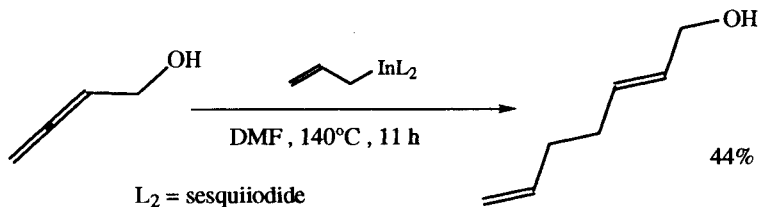
Babler, J.H.; Liptak, V.P.; Phan, N. *J. Org. Chem.*, **1996**, *61*, 416.



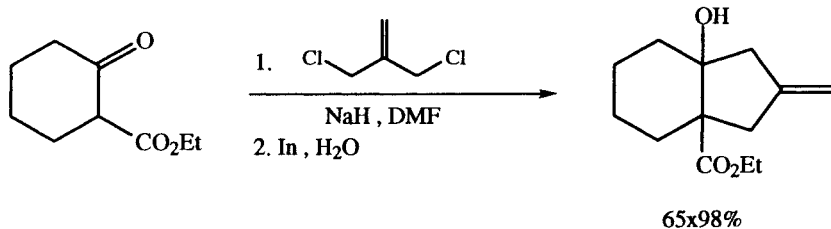
Sen, S.E.; Zhang, Y.Z.; Roach, S.L. *J. Org. Chem.*, **1996**, *61*, 9534.



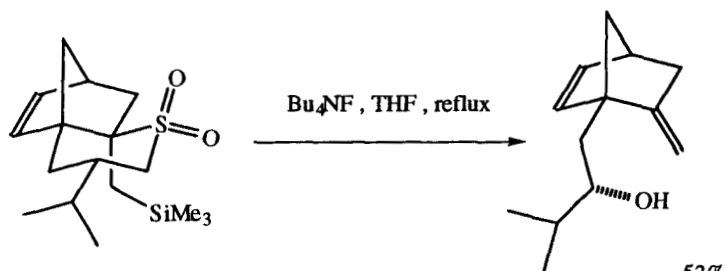
Molander, G.A.; Shakya, S.R. *J. Org. Chem.*, **1996**, *61*, 5885.



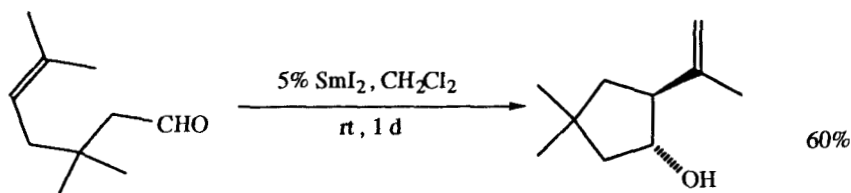
Araki, S.; Usui, H.; Kato, M.; Butsugan, Y. *J. Am. Chem. Soc.*, **1996**, *118*, 4699.



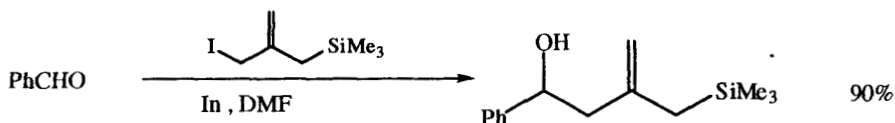
Lu, Y.-Q.; Li, C.-J. *Tetrahedron Lett.*, **1996**, *37*, 471.



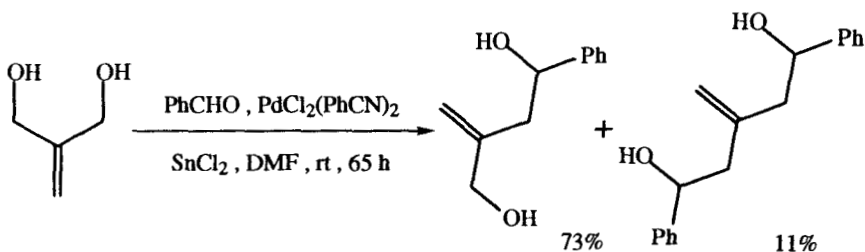
Metz, P.; Seng, D.; Plietker, B. *Tetrahedron Lett.*, **1996**, 37, 3841.



Sarkar, T.K.; Nandy, S.K. *Tetrahedron Lett.*, **1996**, 37, 5195.



Bardot, V.; Remuson, R.; Gelas-Mialhe, Y.; Gramain, J.-C. *SynLett*, **1996**, 37.



Masuyama, Y.; Kagawa, M.; Kurusu, Y. *Chem. Commun.*, **1996**, 585.

#### REVIEW:

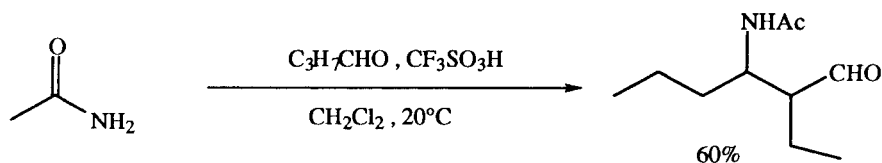
"The Baylis-Hillman Reaction. A Novel Carbon-Carbon Bond Forming Reaction."

Basavaiah, D.; Rao, P.D.; Hyma, R.S. *Tetrahedron*, **1996**, 52, 8001.

Also via: Section 302 (Alkyne - Alcohol).

**SECTION 333: ALDEHYDE - ALDEHYDE**

NO ADDITIONAL EXAMPLES

**SECTION 334: ALDEHYDE - AMIDE**

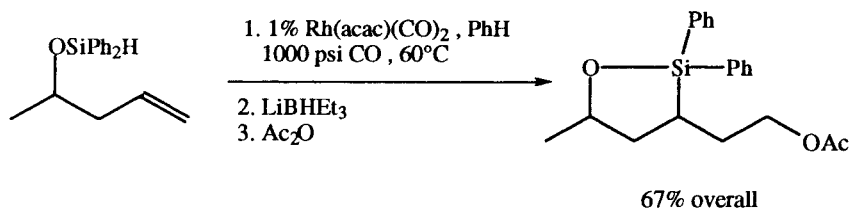
Marson, C.M.; Fallah, A. *Chem. Commun.*, **1998**, 83.

**SECTION 335: ALDEHYDE - AMINE**

NO ADDITIONAL EXAMPLES

**SECTION 336: ALDEHYDE - ESTER**

NO ADDITIONAL EXAMPLES

**SECTION 337: ALDEHYDE - ETHER, EPOXIDE, THIOETHER**

Leighton, J.L.; Chapman, E. *J. Am. Chem. Soc.*, **1997**, *119*, 12416.

**SECTION 338: ALDEHYDE - HALIDE, SULFONATE**

NO ADDITIONAL EXAMPLES

## SECTION 339: ALDEHYDE - KETONE

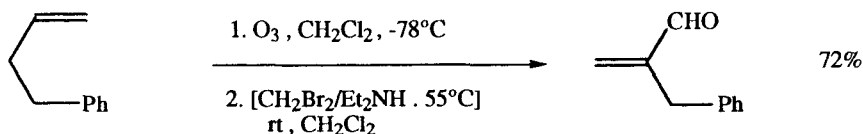
NO ADDITIONAL EXAMPLES

## SECTION 340: ALDEHYDE - NITRILE

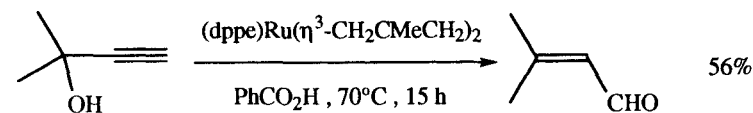
NO ADDITIONAL EXAMPLES

## SECTION 341: ALDEHYDE - ALKENE

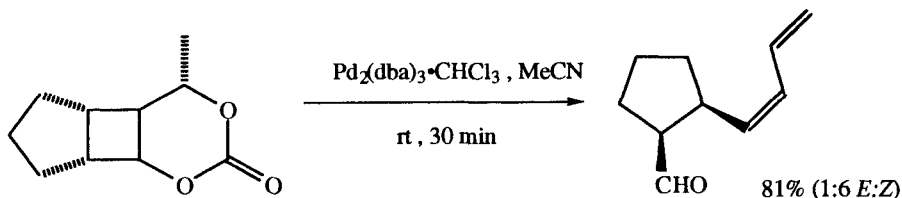
For the oxidation of allylic alcohols to alkene aldehydes, also see Section 48 (Aldehydes from Alcohols).



Hon, Y.-S.; Chang, F.-J.; Lu, L.; Lin, W.-C. *Tetrahedron*, **1998**, *54*, 5233.



Picquet, M.; Bruneau, C.; Dixneuf, P.H. *Chem. Commun.*, **1997**, 1201.



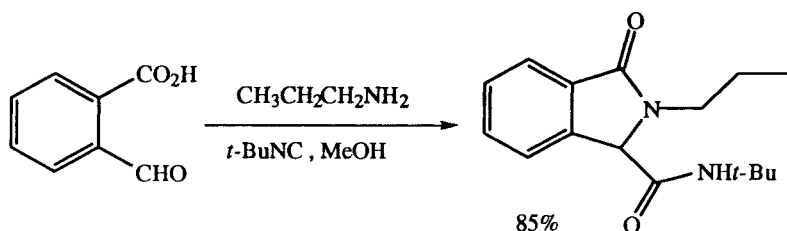
Harayama, H.; Kuroki, T.; Kimura, M.; Tabaka, S.; Tamaru, Y. *Angew. Chem. Int. Ed.*, **1997**, *36*, 2352.



Charoenying, P.; Hemming, K.; McKerrecher, D.; Taylor, T.J.K. *J. Heterocyclic Chem.*, **1996**, *33*, 1083.

Also via  $\beta$ -Hydroxy aldehydes: Section 324 (Alcohols - Aldehyde).

## SECTION 342: AMIDE - AMIDE

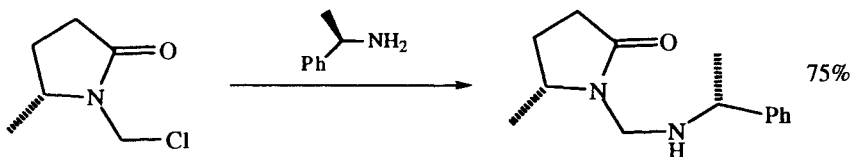


Hanusch-Kompa, C.; Ugi, I. *Tetrahedron Lett*, **1998**, 39, 2725.

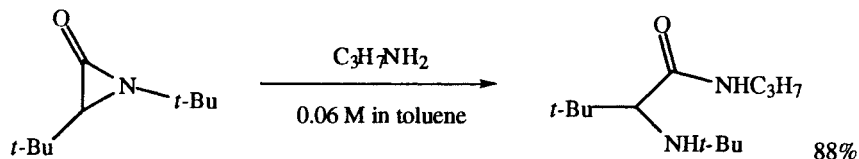
Also via Dicarboxylic Acids:  
Diamines

Section 312 (Carboxylic Acid - Carboxylic Acid)  
Section 350 (Amines - Amines)

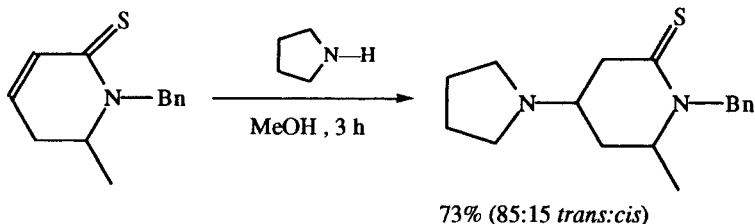
## SECTION 343: AMIDE - AMINE



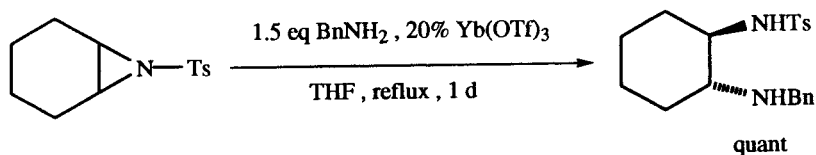
Chen, P.; Tao, S.; Smith, M.B. *Synth. Commun.*, **1998**, 28, 1641.



Talaty, E.R.; Yusoff, M.M. *Chem. Commun.*, **1998**, 985.

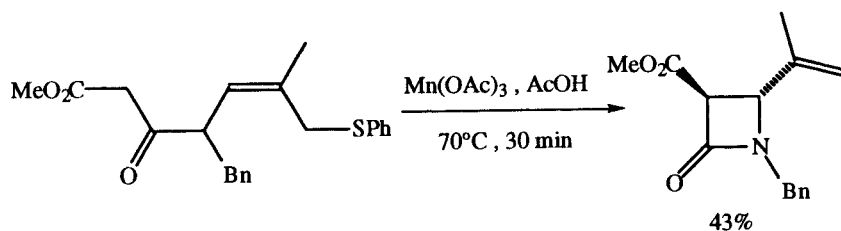


Sośnicki, J.G.; Jagodziński, T.S.; Liebscher, J. *J. Heterocyclic Chem.*, **1997**, 34, 643.

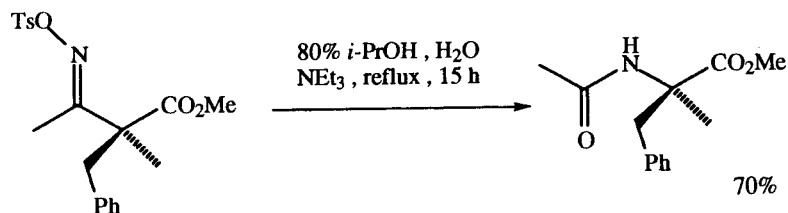


Meguro, M.; Yamamoto, Y. *Heterocycles*, **1996**, *43*, 2473.

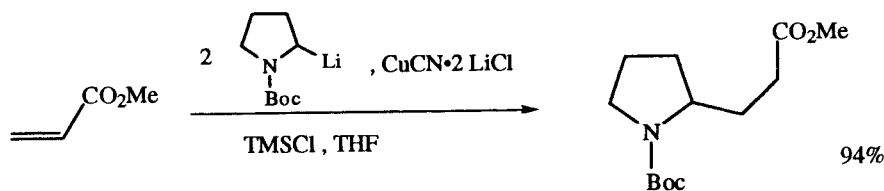
## SECTION 344: AMIDE - ESTER



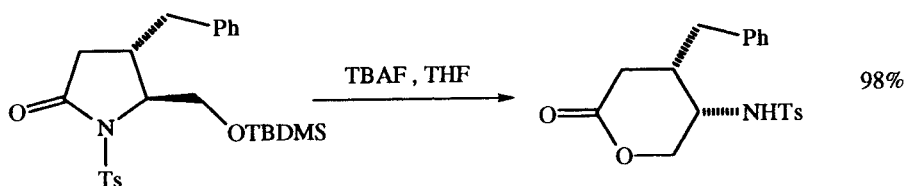
Attenni, B.; Cerreti, A.; D'Annibale, A.; Resta, S.; Trogolo, C. *Tetrahedron*, **1998**, *54*, 12029



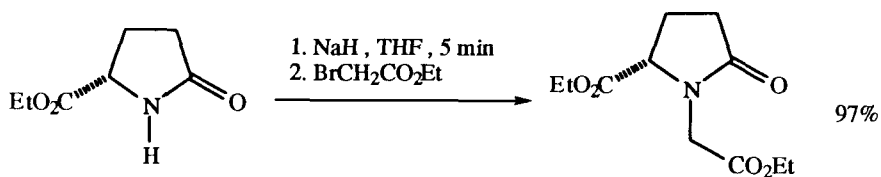
Frutos, R.P.; Spero, D.M. *Tetrahedron Lett.*, 1998, 39, 2475.



Dieter, R.K.; Velu, S.E. *J. Org. Chem.*, 1997, 62, 3798.



Cossy, J.; Cases, M.; Pardo, D.G. *Tetrahedron Lett.*, **1996**, 37, 8173.



Simandan, T.; Smith, M.B. *Synth. Commun.*, **1996**, 26, 1827.

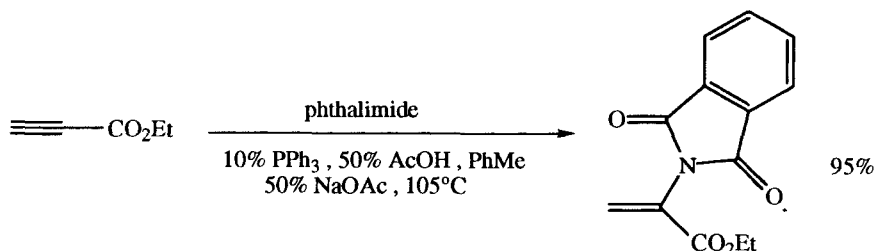
Related Methods:

Section 315 (Carboxylic Acid - Amide)

Section 316 (Carboxylic Acid - Amine)

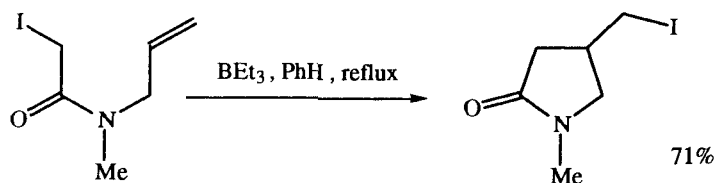
Section 351 (Amine - Ester)

## SECTION 345: AMIDE - ETHER, EPOXIDE, THIOETHER

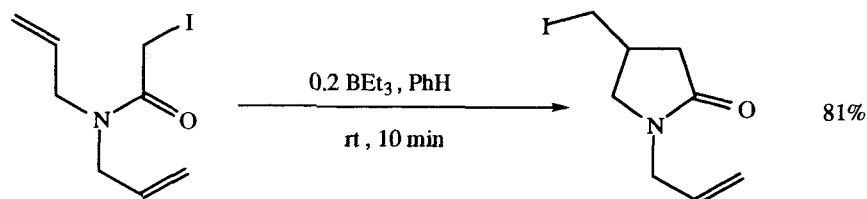


Trost, B.M.; Dake, G.R. *J. Am. Chem. Soc.*, **1997**, 119, 7595.

## SECTION 346: AMIDE - HALIDE, SULFONATE

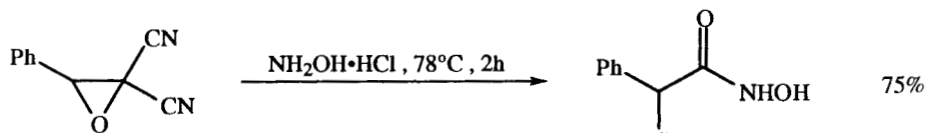


Ikeda, M.; Teranishi, H.; Nozaki, K.; Ishibashi, H. *J. Chem. Soc., Perkin Trans. 1*, **1998**, 169

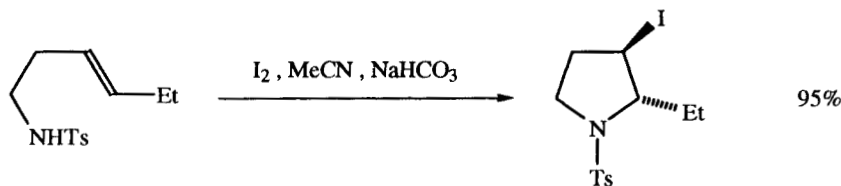


Ikeda, M.; Terahishi, H.; Iwamura, N.; Ishibashi, H. *Heterocycles*, **1997**, 45, 863.



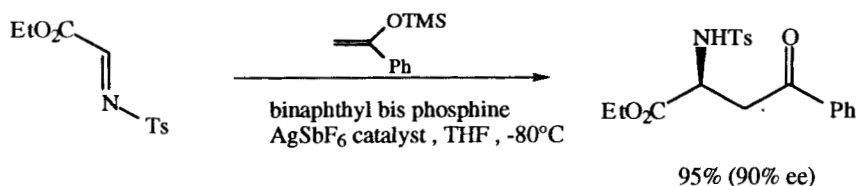


Said, B.; Abdelaziz, S.; Albert, R. *Tetrahedron Lett.*, **1996**, 37, 179.

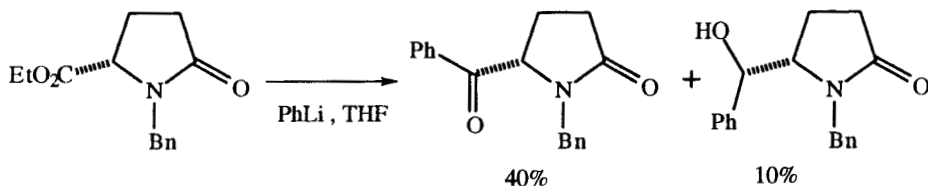


Jones, A.D.; Knight, D.W. *Chem. Commun.*, **1996**, 915.

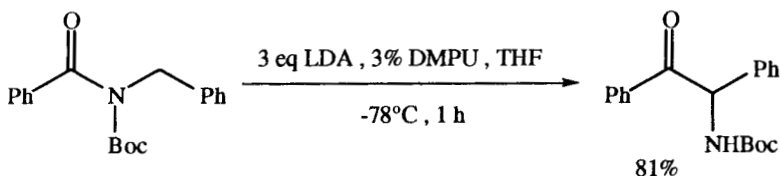
## SECTION 347: AMIDE - KETONE



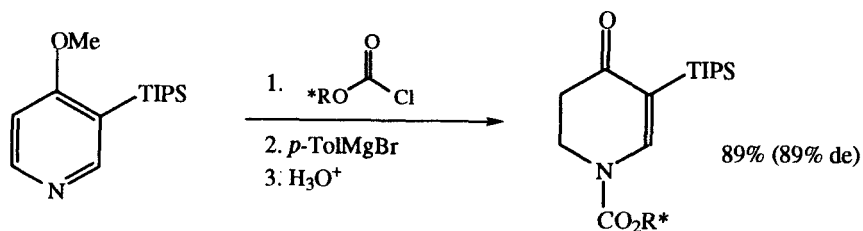
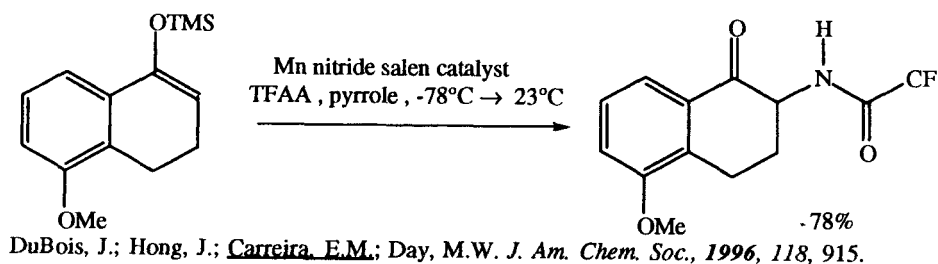
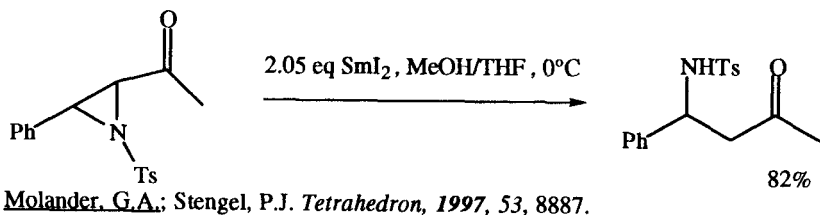
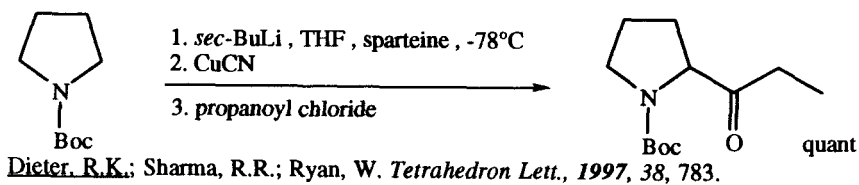
Ferraris, D.; Young, B.; Dudding, T.; Kectka, T. *J. Am. Chem. Soc.*, **1998**, 120, 4548.



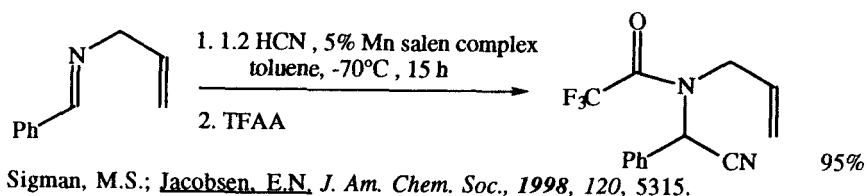
Deskus, J.; Fan, D.; Smith, M.B. *Synth. Commun.*, **1998**, 28, 1649.



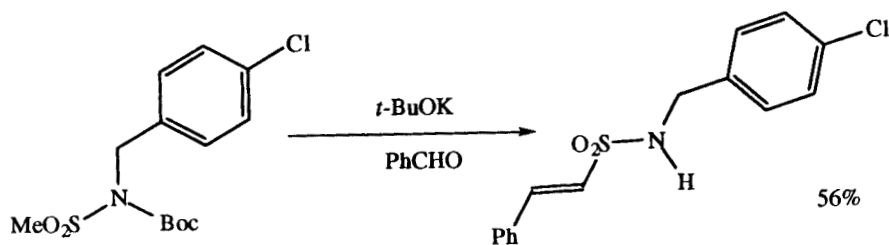
Hara, O.; Ito, M.; Hamada, Y. *Tetrahedron Lett.*, **1998**, 39, 5537.



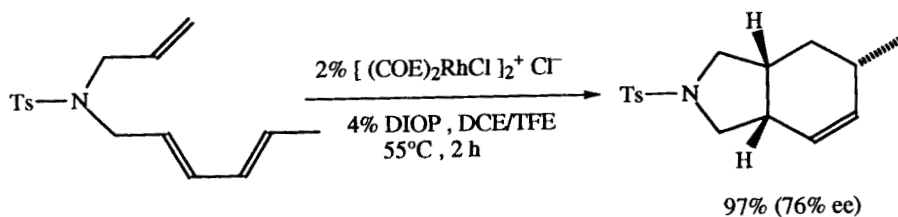
## SECTION 348: AMIDE - NITRILE



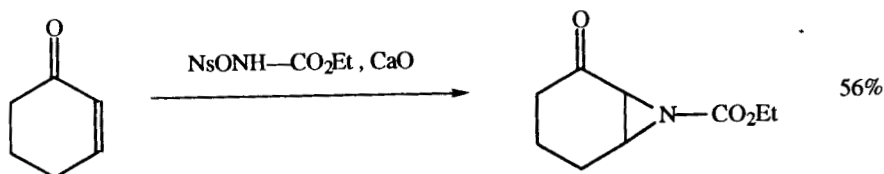
## SECTION 349: AMIDE - ALKENE



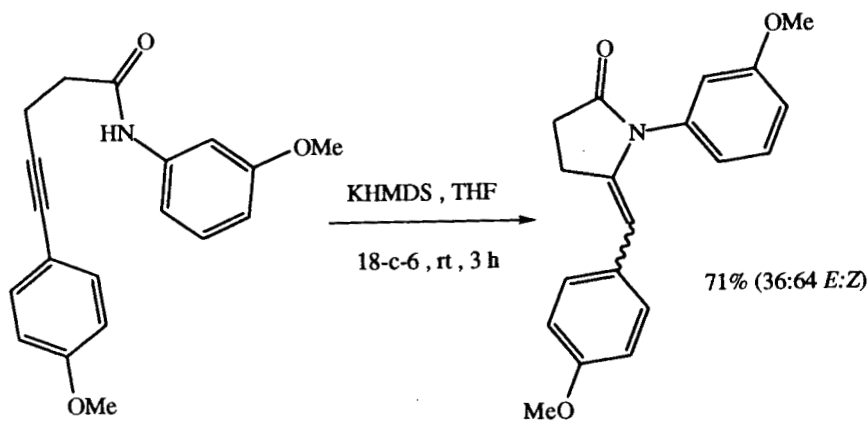
Tozer, M.J.; Woolford, A.J.A.; Linney, I.D. *SynLett*, **1998**, 186.



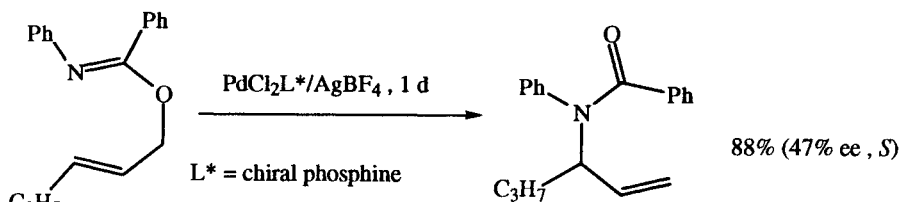
O'Mahony, D.J.R.; Belanger, D.B.; Livinghouse, T. *SynLett*, **1998**, 443.



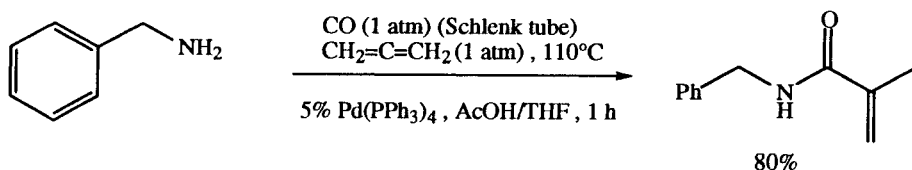
Fioravanti, S.; Pellacani, L.; Tabanella, S.; Tardella, P.A. *Tetrahedron*, **1998**, 54, 14105.



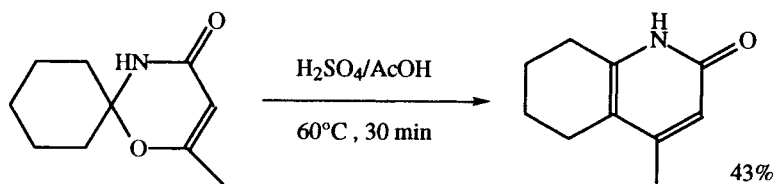
Koseki, Y.; Kusano, S.; Nagasaka, T. *Tetrahedron Lett.*, **1998**, 39, 3517.



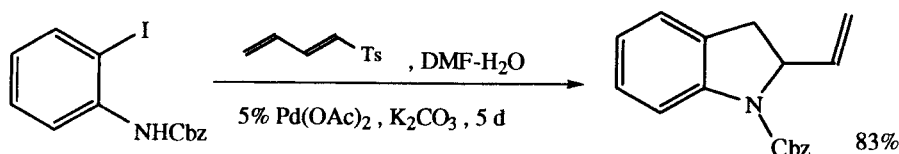
Uozumi, Y.; Kato, K.; Hayashi, T. *Tetrahedron Asymmetry*, **1998**, 9, 1065.



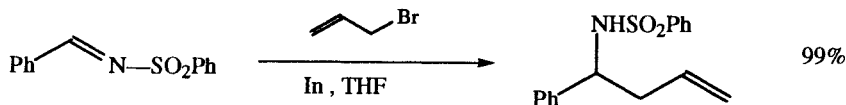
Grigg, R.; Montieth, M.; Sridharan, V.; Terrier, C. *Tetrahedron*, **1998**, 54, 3885.



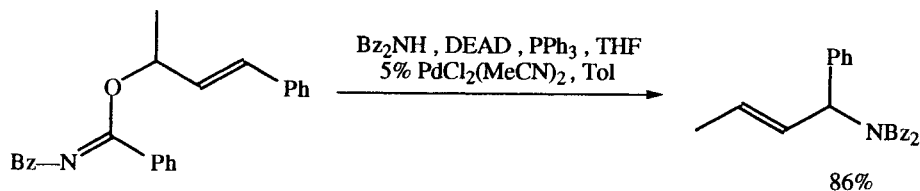
Stambach, J.E.; Jung, L.; Hug, R. *Synthesis*, **1998**, 265.



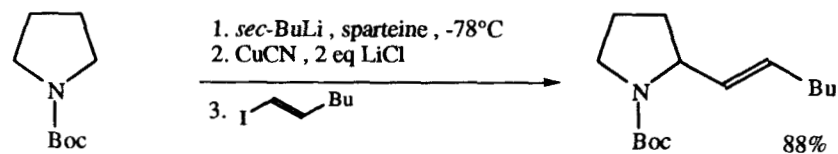
Back, T.G.; Bethell, R.J. *Tetrahedron Lett*, **1998**, 39, 5463.



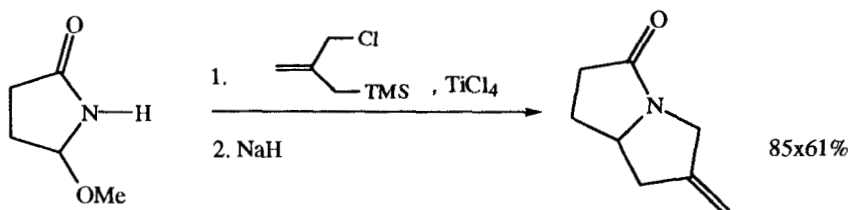
Chan, T.H.; Lu, W. *Tetrahedron Lett.*, **1998**, 39, 8605.



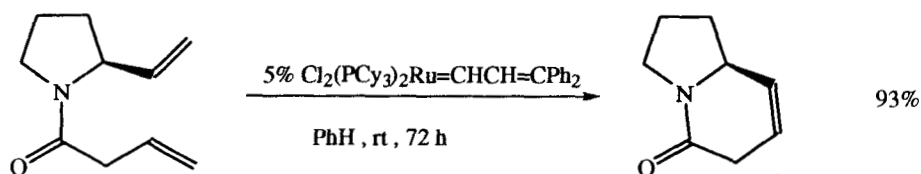
Overman, L.E.; Zipp, G.G. *J. Org. Chem.*, **1997**, 62, 2288.



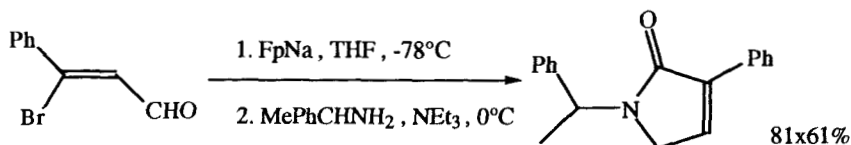
Dieter, R.K.; Sharma, R.R. *Tetrahedron Lett.*, **1997**, 38, 5937.



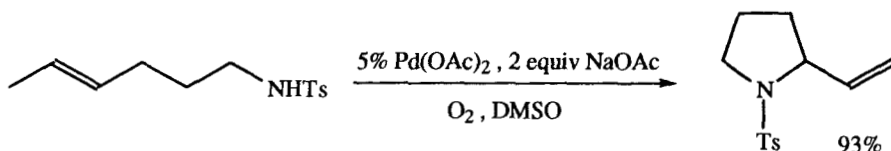
Sadakane, M.; Vahle, R.; Schierle, K.; Kolter, D.; Steckhan, E. *SynLett*, **1997**, 95.



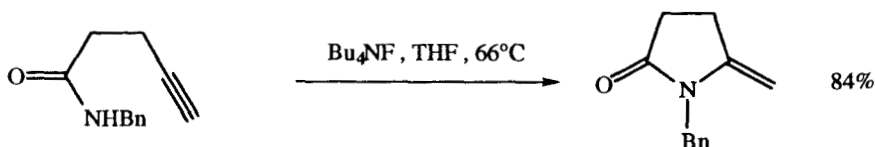
Arisawa, M.; Takezawa, E.; Nishida, A.; Mori, M.; Nakagawa, M. *SynLett*, **1997**, 1179.



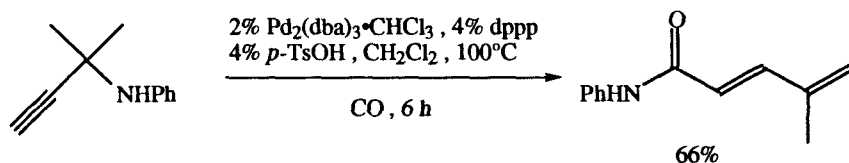
Rück-Braun, K. *Angew. Chem. Int. Ed.*, **1997**, 36, 509.



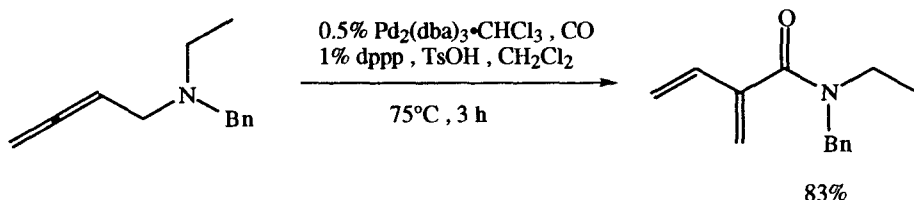
Larock, R.C.; Hightower, T.R.; Hasvold, L.A.; Peterson, K.P. *J. Org. Chem.*, **1996**, 61, 3584



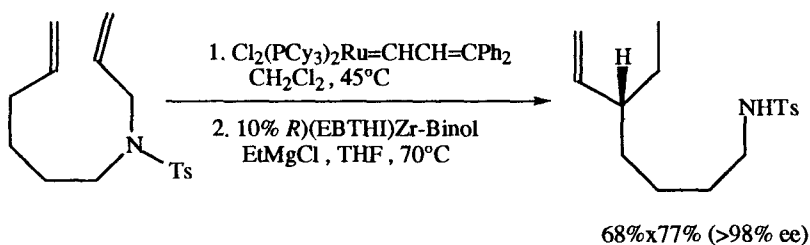
Jacobi, P.A.; Briemann, H.L.; Hauck, S.I. *J. Org. Chem.*, **1996**, 61, 5013.



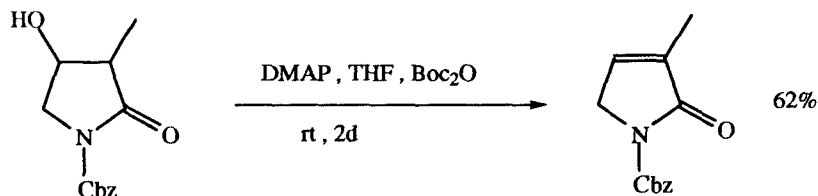
Imada, Y.; Alper, H. *J. Org. Chem.*, **1996**, 61, 6766.



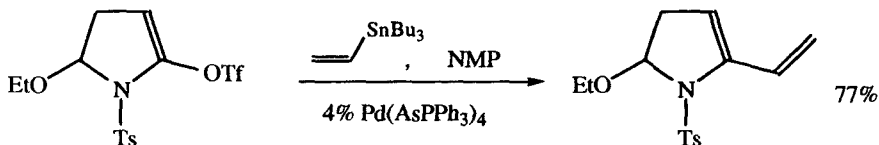
Imada, Y.; Vasapollo, G.; Alper, H. *J. Org. Chem.*, **1996**, 61, 7982.



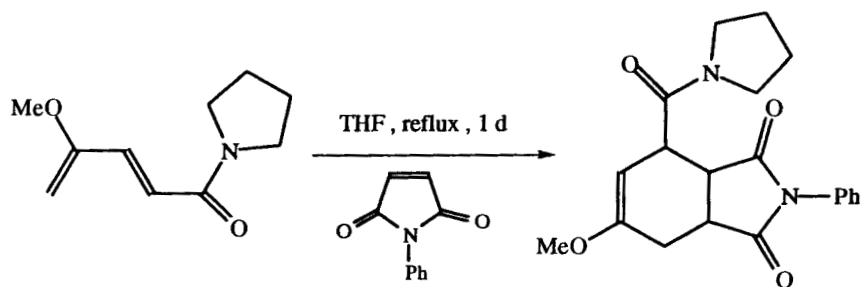
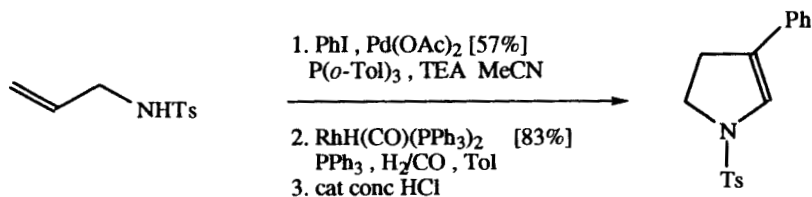
Visser, M.S.; Heron, N.M.; Didiuk, M.T.; Sagal, J.F.; Hoveyda, A.H.  
*J. Am. Chem. Soc.*, **1996**, 118, 4291.



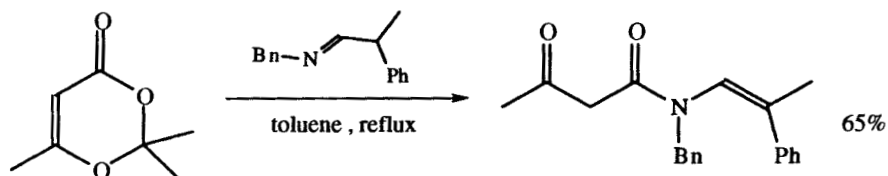
Mattern, R.-H. *Tetrahedron Lett.*, **1996**, 37, 291.



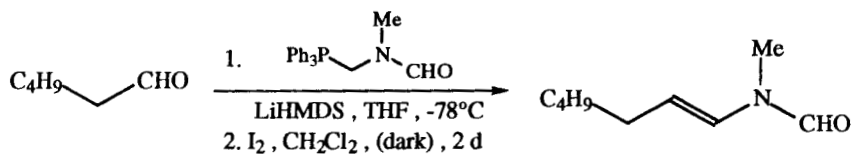
Bernabé, P.; Rutjes, P.J.T.; Hiemstra, H.; Speckamp, W.N. *Tetrahedron Lett.*, **1996**, 37, 3561

56% (10:1 *endo:exo*)Bernabeu, M.C.; Chinchilla, R.; Nájera, C.; Rodríguez, M.A. *Tetrahedron Lett.*, **1996**, 37, 3595

57x83%

Busacca, C.A.; Dong, Y. *Tetrahedron Lett.*, **1996**, 37, 3947.

65%

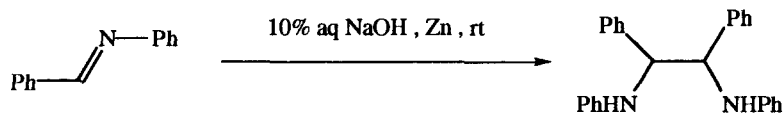
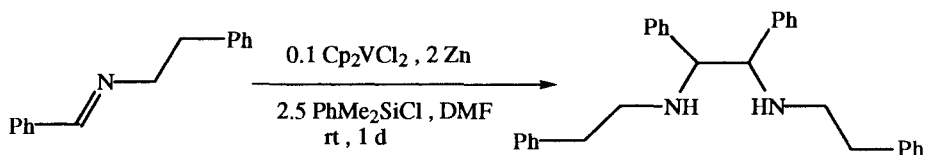
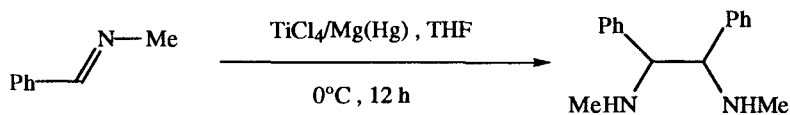
D'Annibale, A.; Pesce, A.; Resta, S.; Trogolo, C. *Tetrahedron Lett.*, **1996**, 37, 7429.

79%

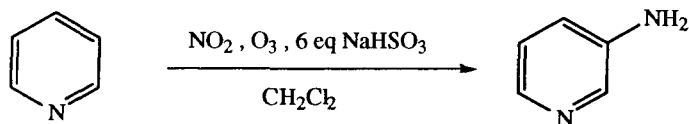
Paterson, I.; Cowden, C.; Watson, C. *SynLett*, **1996**, 209.

Also via Alkenyl Acids: Section 322 (Carboxylic Acid -Alkene)

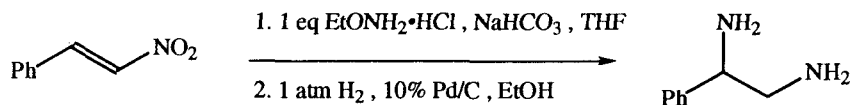
## SECTION 350: AMINE - AMINE

90% (80:20 *dl:meso*)Dutta, M.P.; Baruah, B.; Boruah, A.; Prajapati, D.; Sandhu, J.S. *SynLett*, **1998**, 857.64% (83:17 *meso:dl*)Hatano, B.; Ogawa, A.; Hirao, T. *J. Org. Chem.*, **1998**, 63, 9421.63% (80:20 *dl:meso*)

+ 24% BnNHMe

Alexakis, A.; Aujard, I.; Mangeney, P. *SynLett*, **1998**, 873, 875.

56%

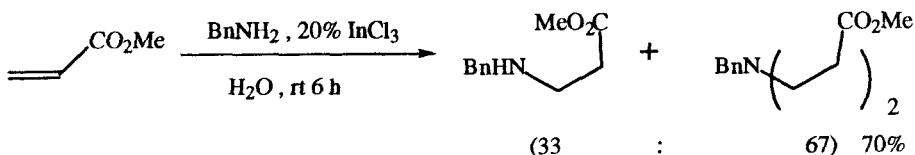
Suzuki, H.; Iwaya, M.; Mori, T. *Tetrahedron Lett.*, **1997**, 38, 5647.

88%

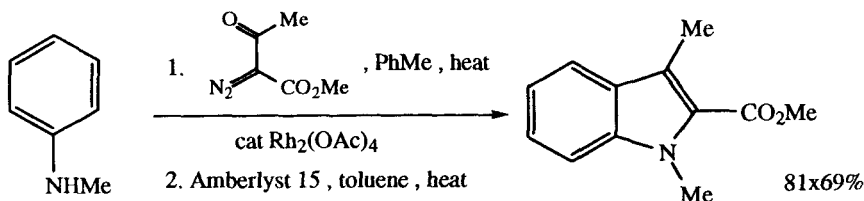
Imagawa, K.; Hata, E.; Yamada, T.; Mukaiyama, T. *Chem. Lett.*, **1996**, 291.



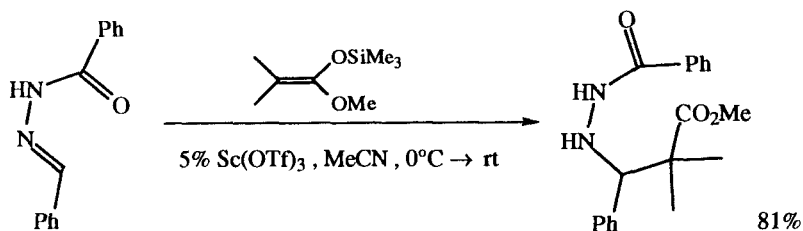
## SECTION 351: AMINE - ESTER



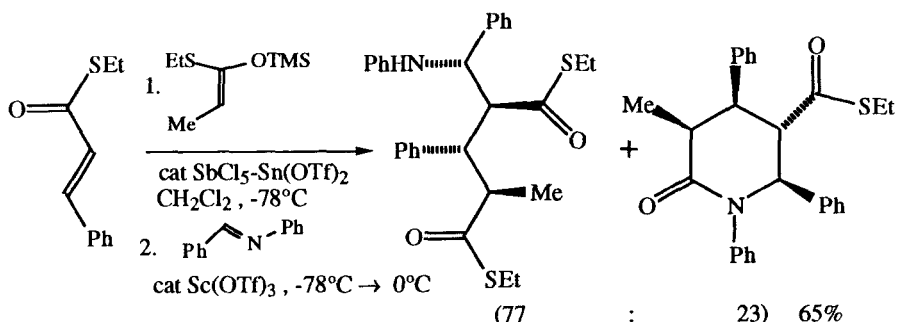
Loh, T.-P.; Wei, L.-L. *SynLett*, **1998**, 975.



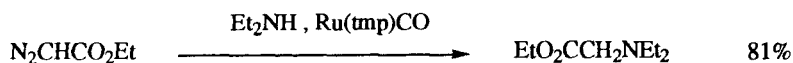
Moody, C.J.; Swann, E. *SynLett*, **1998**, 135.



Oyamada, H.; Kobayashi, S. *SynLett*, **1998**, 249.

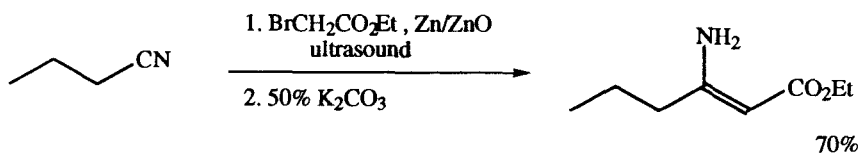


Kobayashi, S.; Akiyama, R.; Moriwaki, M. *Tetrahedron Lett*, **1997**, 38, 4819.

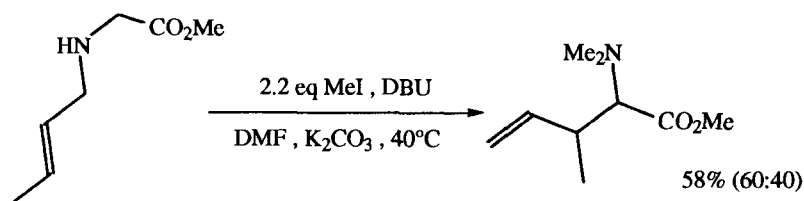


tmp = 5,10,15,20-tetramesitylporphyrin dianion

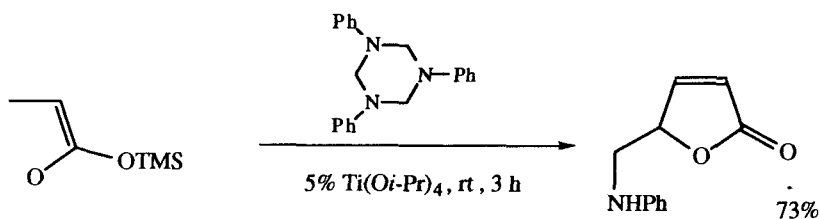
Galardon, E.; Le Maux, P.; Simonneaux, G. *J. Chem. Soc., Perkin Trans. 1*, **1997**, 2455.



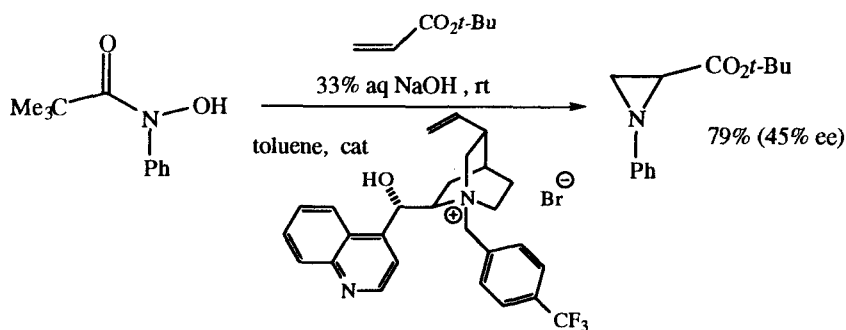
Lee, A.S.-Y.; Cheng, R.-Y.; Pan, O.-G. *Tetrahedron Lett.*, **1997**, 38, 443.



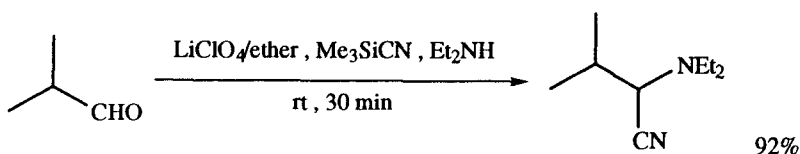
Coldham, J.; Middleton, M.L.; Taylor, P.L. *J. Chem. Soc., Perkin Trans. 1*, **1997**, 2951.



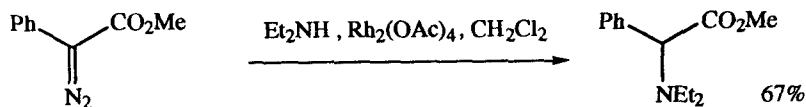
Ha, H.-I.; Kang, K.-H.; Ahn, Y.-G.; Oh, S.-J. *Heterocycles*, **1997**, 45, 277.



Aires-de-Sousa, J.; Labo, A.M.; Prabhakar, S. *Tetrahedron Lett.*, **1996**, 37, 3183.



Shimizu, M.; Kume, K.; Fujisawa, T. *Chem. Lett.*, **1996**, 545.



Aller, E.; Buck, R.T.; Drysdale, M.J.; Ferris, L.; Haigh, D.; Moody, C.J.; Pearson, N.D.; Sanghera, J.B. *J. Chem. Soc., Perkin Trans. 1*, **1996**, 2879.

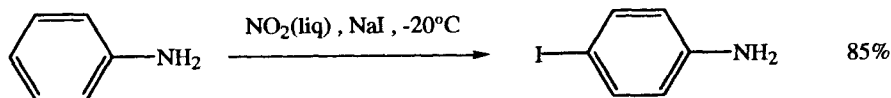
Related Methods:

Section 315 (Carboxylic Acid - Amide)  
 Section 316 (Carboxylic Acid - Amine)  
 Section 344 (Amide - Ester)

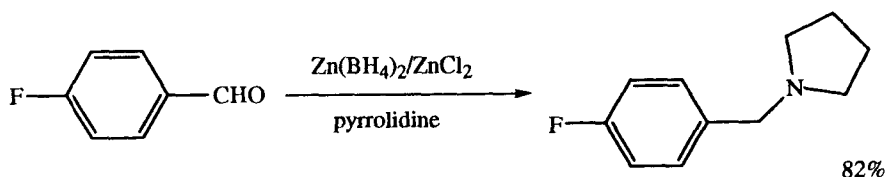
## SECTION 352: AMINE - ETHER, EPOXIDE, THIOETHER

NO ADDITIONAL EXAMPLES

## SECTION 353: AMINE - HALIDE, SULFONATE

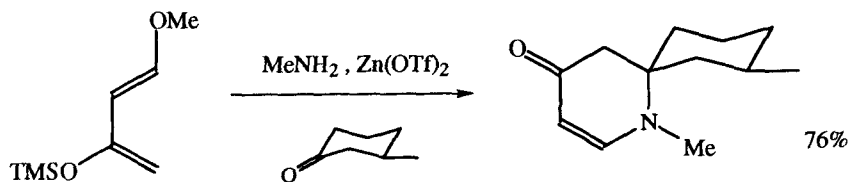


Suzuki, H.; Nonoyama, N. *Tetrahedron Lett*, **1998**, 39, 4533.

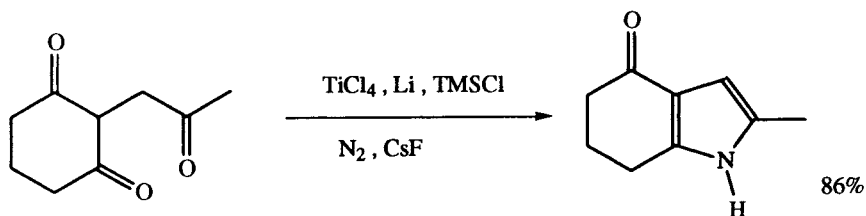


Bhattacharyya, S.; Chatterjee, A.; Williamson, J.S. *Synth. Commun.*, **1997**, 27, 4265.

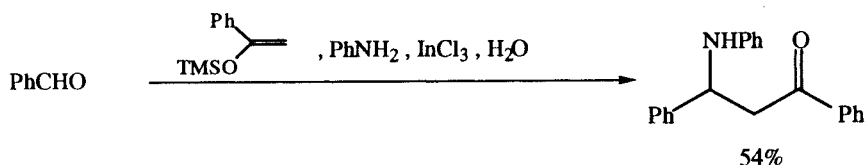
## SECTION 354: AMINE - KETONE



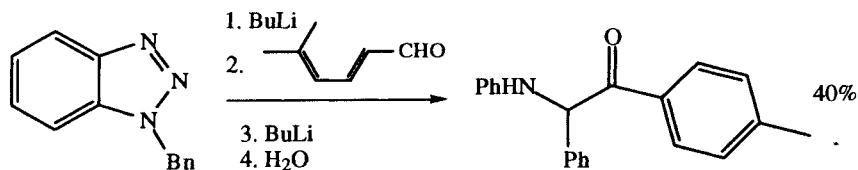
Huang, P.; Isayan, K.; Sarkissian, A.; Oh, T. *J. Org. Chem.*, **1998**, 63, 4500.



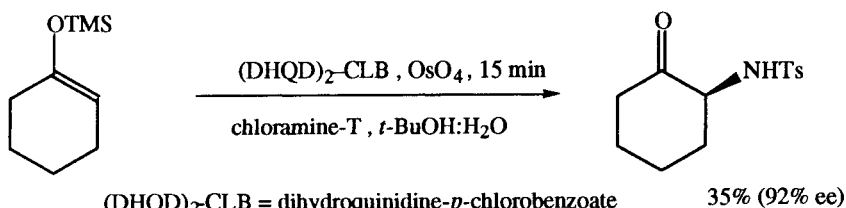
Mori, M.; Hori, K.; Akashi, M.; Hori, M.; Sato, Y.; Nishida, M.  
*Angew. Chem. Int. Ed.*, **1998**, 37, 636.



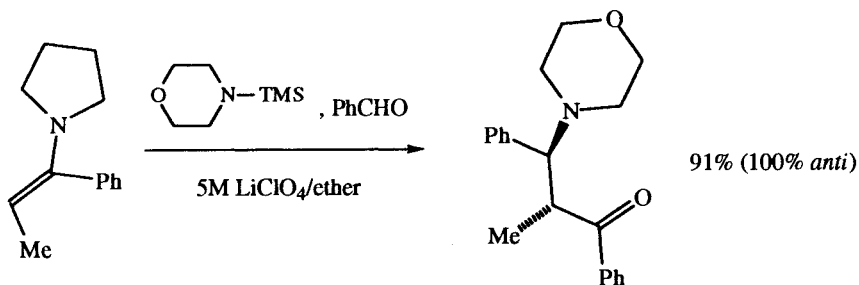
Loh, T.-P.; Wei, L.-L. *Tetrahedron Lett.*, **1998**, 39, 323.



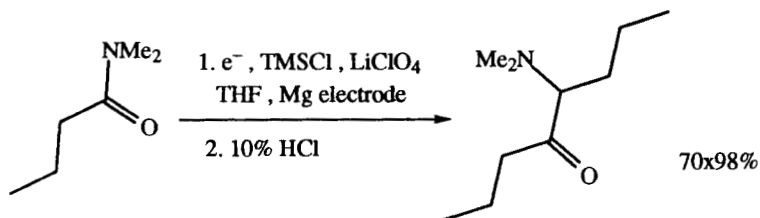
Katritzky, A.R.; Zhang, Z.; Lang, H.; Xie, L. *Heterocycles*, **1998**, 47, 187.



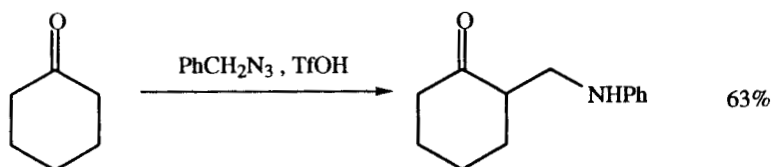
(DHQD)<sub>2</sub>-CLB = dihydroquinidine-*p*-chlorobenzoate  
 Phukan, P.; Sudalai, A. *Tetrahedron Asymmetry*, **1998**, 9, 1001.



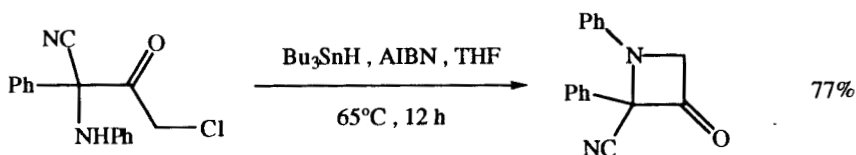
Zarghi, A.; Naimi-Jamal, M.R.; Webb, S.A.; Balalaie, S.; Saidi, M.R.; Ipaktschi, J.  
*Eur. J. Org. Chem.*, **1998**, 197.



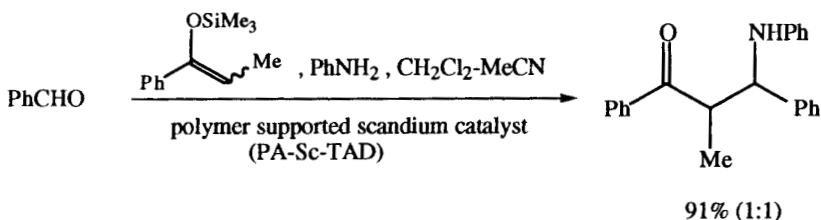
Kashimura, S.; Ishifune, M.; Murai, Y.; Murase, H.; Shimomura, M.; Shono, T. *Tetrahedron Lett.*, **1998**, 39, 6199.



Schildknegt, K.; Agrios, K.A.; Aubé, J. *Tetrahedron Lett.*, **1998**, 39, 7687.

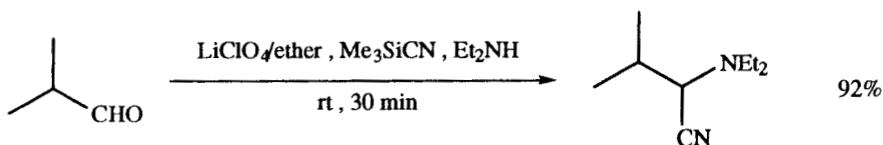


Chowdhury, A.R.; Kumar, V.V.; Roy, R.; Bhaduri, A.P. *J. Chem. Res. (S)*, **1997**, 254.

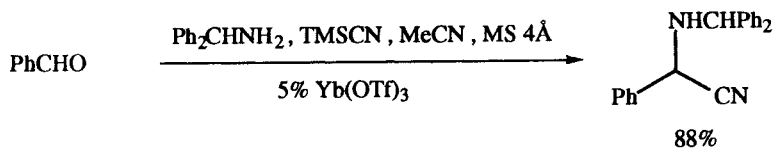


Kobayashi, S.; Nagayama, S.; Busujima, T. *Tetrahedron Lett.*, **1996**, 37, 9221.

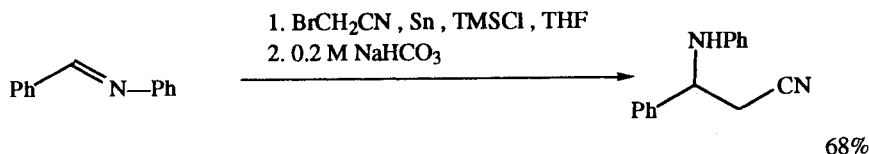
## SECTION 355: AMINE - NITRILE



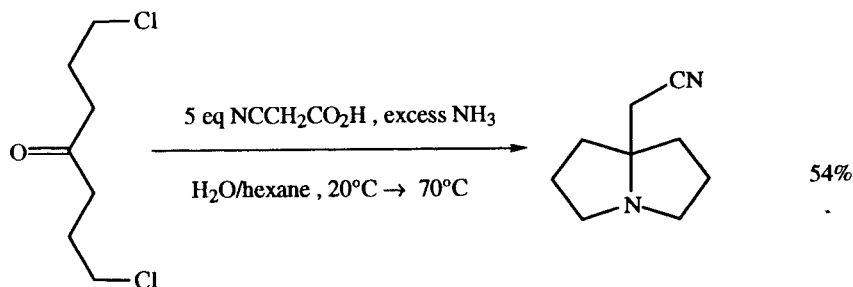
Heydari, A.; Fatemi, P.; Alizadeh, A.-A. *Tetrahedron Lett.*, **1998**, 39, 3049.



Kobayashi, S.; Ishitani, H.; Ueno, M. *SynLett*, **1997**, 115.

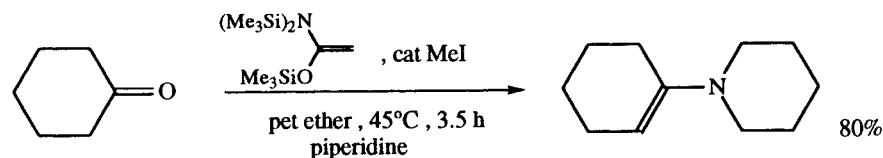


Sun, P.; Zhang, Y. *Synth. Commun.*, **1997**, 27, 3175.

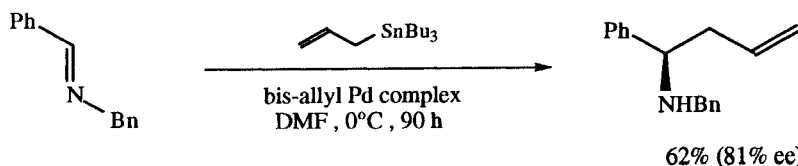


Oka, M.; Baba, K.; Suzuki, T.; Matsumoto, Y. *Heterocycles*, **1997**, 45, 2317.

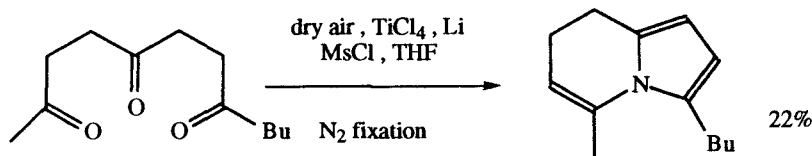
## SECTION 356: AMINE - ALKENE



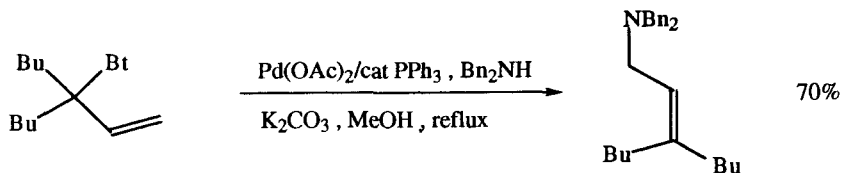
Yamamoto, Y.; Matui, C. *J. Org. Chem.*, **1998**, 63, 377.



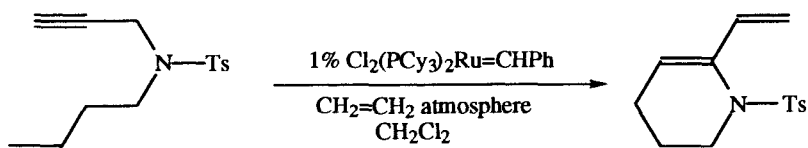
Nakamura, H.; Nakamura, K.; Yamamoto, Y. *J. Am. Chem. Soc.*, **1998**, 120, 4242.



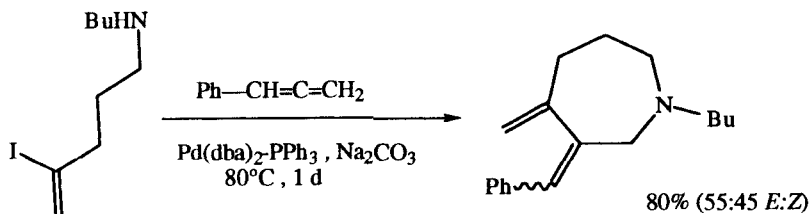
Mori, M.; Hori, M.; Sato, Y. *J. Org. Chem.*, **1998**, *63*, 4832.



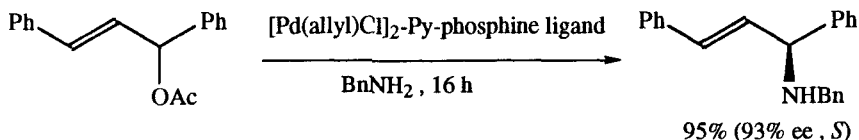
Katritzky, A.R.; Yao, J.; Qui, M. *J. Org. Chem.*, **1998**, *63*, 5232.



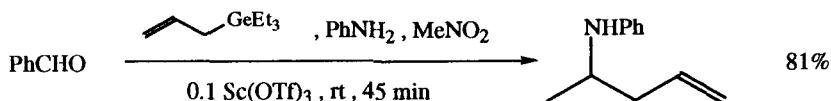
Mori, M.; Sakakibara, N.; Kinoshita, A. *J. Org. Chem.*, **1998**, *63*, 6082.



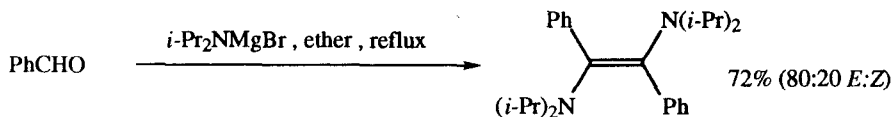
Larock, R.C.; Tu, C.; Pace, P. *J. Org. Chem.*, **1998**, *63*, 6859.



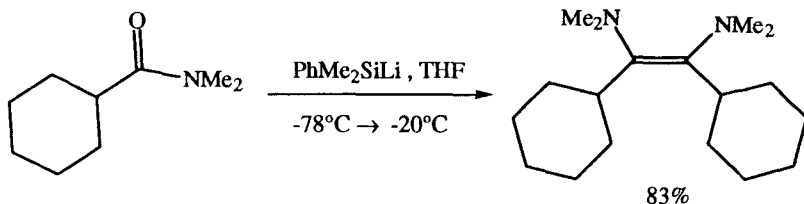
Constantieux, T.; Brunel, J.-M.; Labande, A.; Buono, G. *SynLett.*, **1998**, 49.



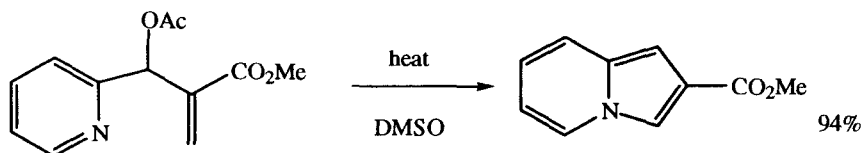
Akiyama, T.; Iwai, J. *SynLett.*, **1998**, 273.



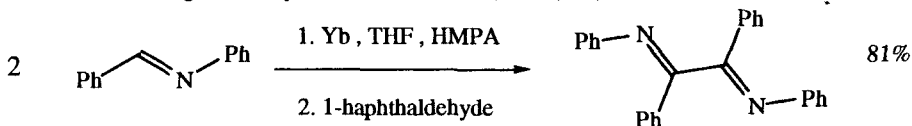
Kobayashi, K.; Uneda, T.; Uchida, M.; Furuta, Y.; Tanmatsu, M.; Morikawa, O.; Konishi, H  
*Chem. Lett.*, **1998**, 87.



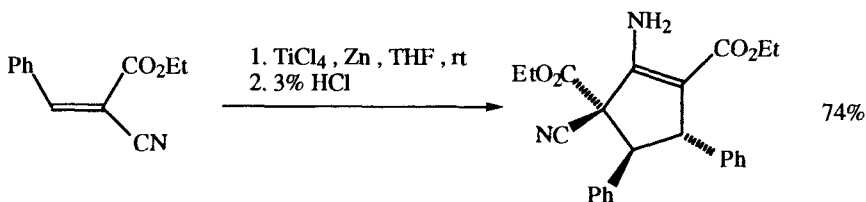
Fleming, I.; Ghosh, U.; Mack, S.R.; Clark, B.P. *Chem. Commun.*, **1998**, 74.



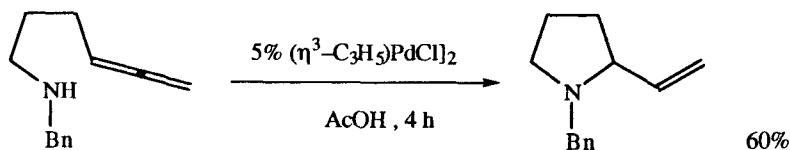
Deane, P.O.; George, R.; Kaye, P.T. *Tetrahedron*, **1998**, 54, 3871.



Jin, W.-S.; Makioka, Y.; Tankguchi, Y.; Kitamura, T.; Fujiwara, Y.  
*Chem. Commun.*, **1998**, 1101.

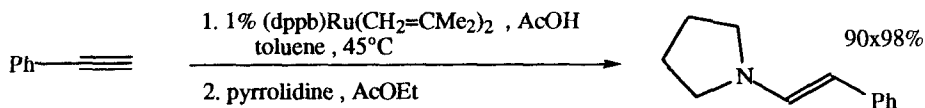


Zhou, L.-L.; Tu, S.-j.; Shi, D.-q.; Dai, G.-y.; Chen, W.-x. *Synthesis*, **1998**, 851.

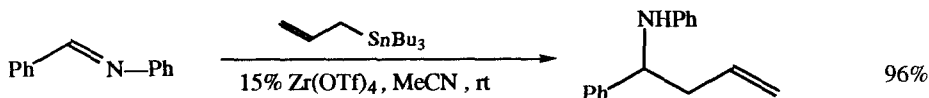


Meguro, M.; Yamamoto, Y. *Tetrahedron Lett.*, **1998**, 39, 5421.

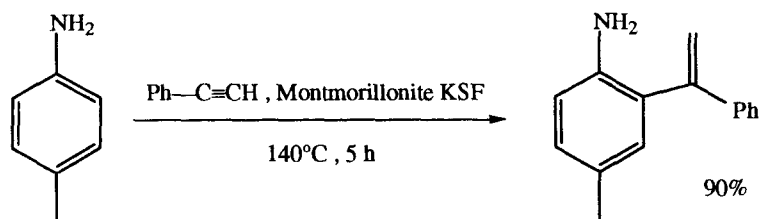




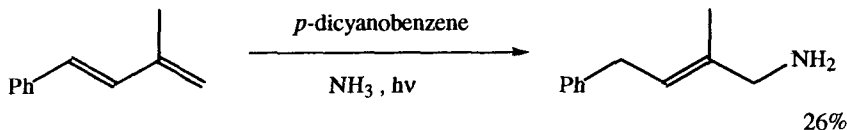
Doucet, H.; Bruneau, C.; Dixneuf, P.H. *SynLett.*, **1997**, 807.



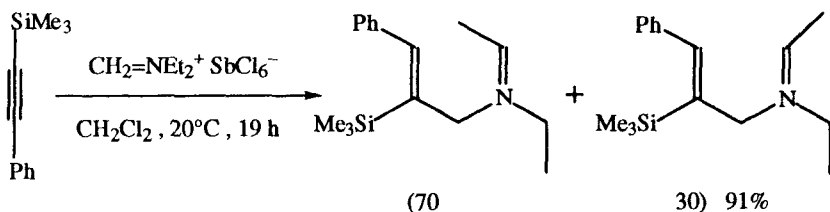
Kobayashi, S.; Inamoto, S.; Nagayama, S. *SynLett.*, **1997**, 1099.



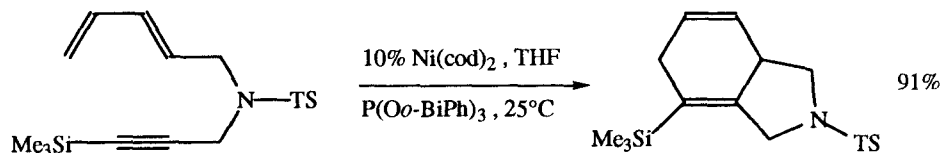
Arienti, A.; Bigi, F.; Maggi, R.; Marzi, E.; Moggi, P.; Rastelli, M.; Sartori, G.; Tarantola, F. *Tetrahedron*, **1997**, 53, 3795.



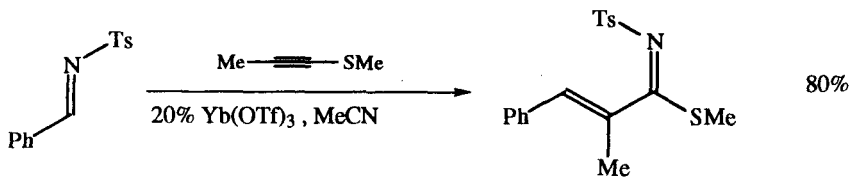
Kojima, R.; Yamashita, T.; Tanabe, K.; Shiragami, T.; Yasuda, M.; Shima, K. *J. Chem. Soc., Perkin Trans. 1*, **1997**, 217.



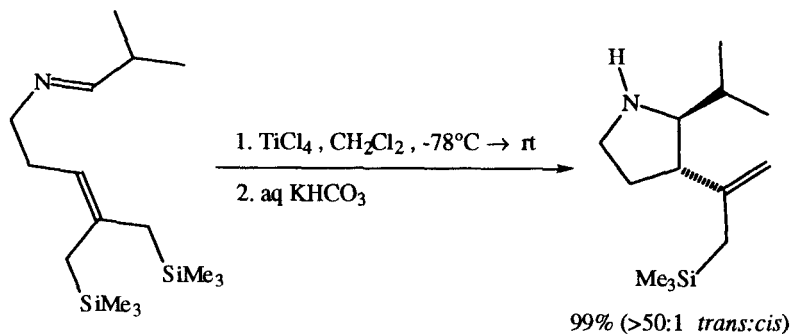
Ofial, A.R.; Mayr, H. *Angew. Chem. Int. Ed.*, **1997**, 36, 143.



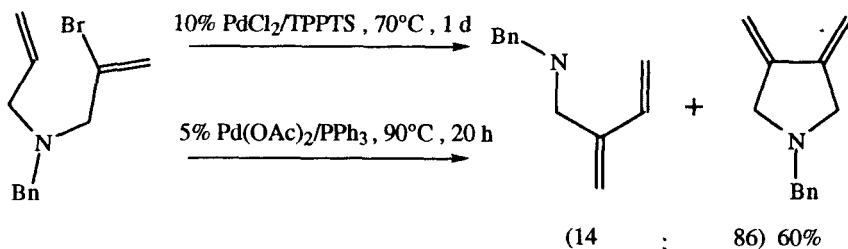
Wender, P.A.; Smith, T.E. *J. Org. Chem.*, **1996**, 61, 824.



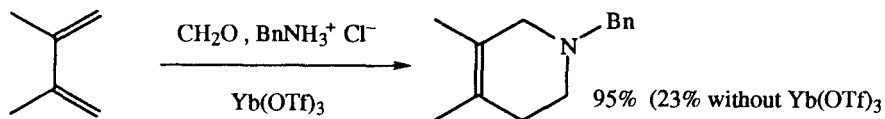
Ishitani, H.; Nagayama, S.; Kobayashi, S. *J. Org. Chem.*, **1996**, 61, 1902.



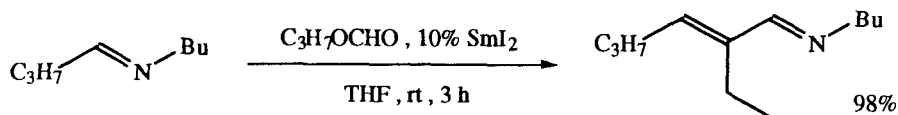
Kercher, T.; Livinghouse, T. *J. Am. Chem. Soc.*, **1996**, 118, 4200.



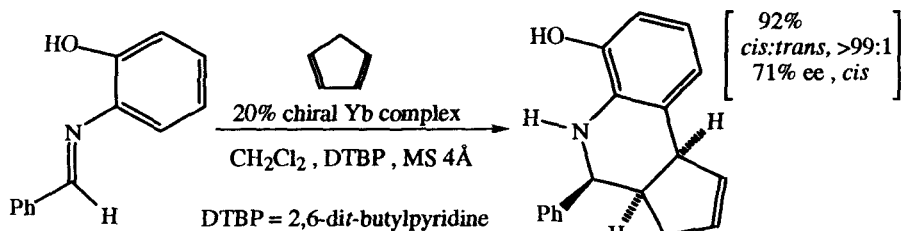
Lemaire-Audoire, S.; Savignac, M.; Dupuis, C.; Genêt, J.-P. *Tetrahedron Lett.*, **1996**, 37, 2003.



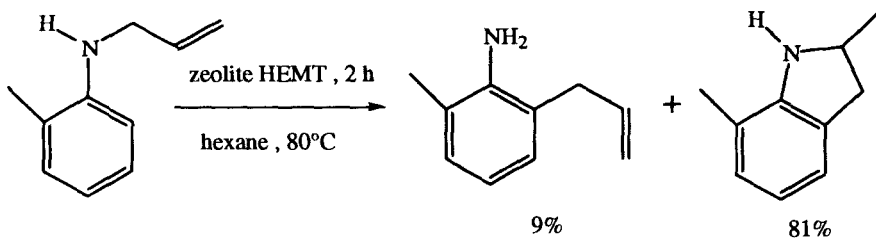
Yu, L.; Chen, D.; Wang, P.G. *Tetrahedron Lett.*, **1996**, 37, 2169.



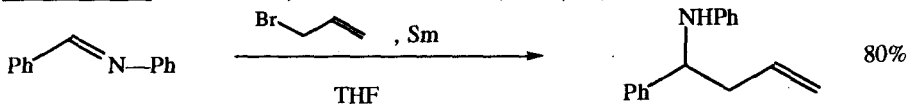
Shiraishi, H.; Kawasaki, Y.; Sakaguchi, S.; Nishiyama, Y.; Ishii, Y. *Tetrahedron Lett.*, **1996**, 37, 7291.



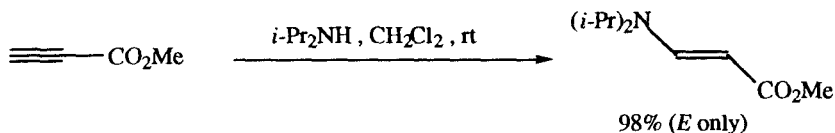
Ishitani, H.; Kobayashi, S. *Tetrahedron Lett.*, **1996**, 37, 7357.



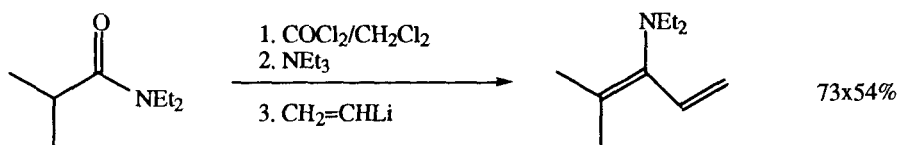
Sreekumar, R.; Padmakumar, R. *Tetrahedron Lett.*, **1996**, 37, 5281.



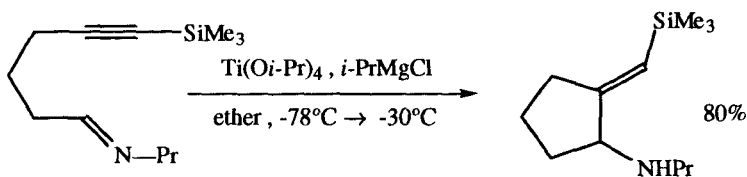
Wang, J.; Zhang, Y.; Bao, W. *Synth. Commun.*, **1996**, 26, 2473.



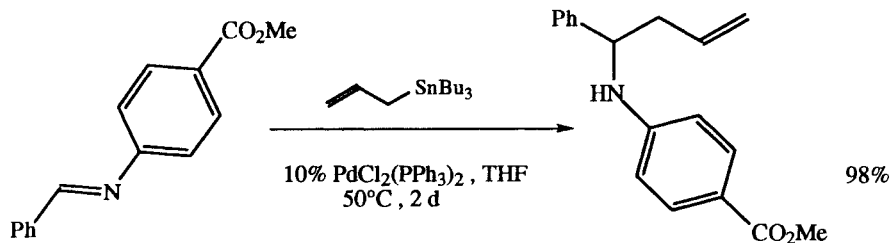
Cossu, S.; De Lucchi, O.; Durr, R. *Synth. Commun.*, **1996**, 26, 4597.



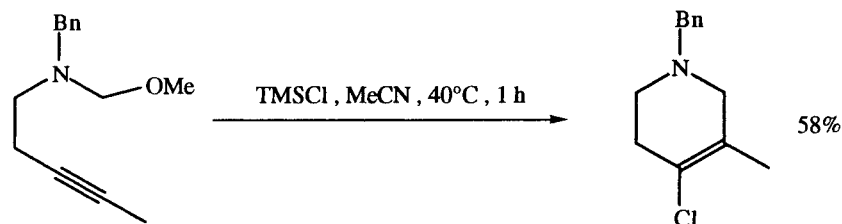
Enders, D.; Hecker, P.; Meyer, O. *Tetrahedron*, **1996**, 52, 2909.



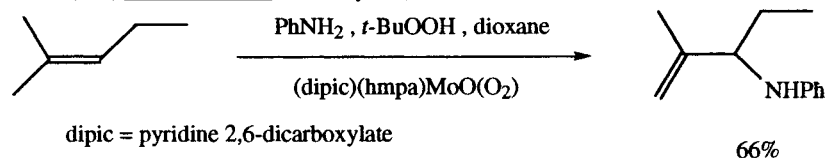
Gao, Y.; Harada, K.; Sato, F. *Chem. Commun.*, **1996**, 533.



Nakamura, H.; Iwama, H.; Yamamoto, Y. *Chem. Commun.*, **1996**, 1459.



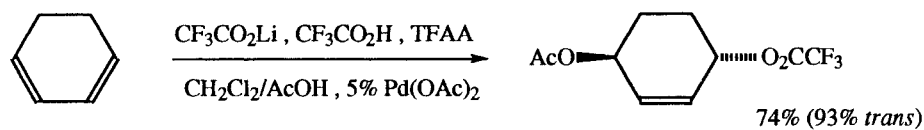
Murata, Y.; Overman, L.E. *Heterocycles*, **1996**, 42, 549.



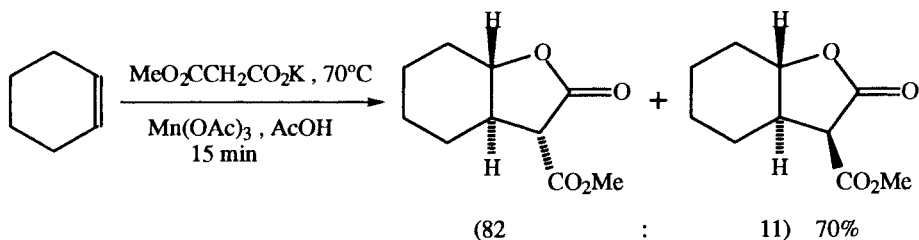
dipic = pyridine 2,6-dicarboxylate

Srivastava, R.S.; Nicholas, K.M. *Chem. Commun.*, **1996**, 2335.

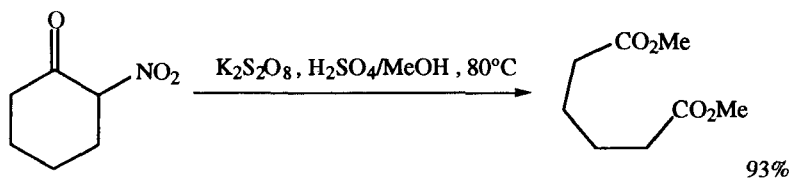
## SECTION 357: ESTER - ESTER



Aranyos, A.; Szabó, K.J.; Bäckvall, J.-E. *J. Org. Chem.*, **1998**, 63, 2523.



Lamarque, L.; Méou, A.; Brun, P. *Tetrahedron*, **1998**, 54, 6497.

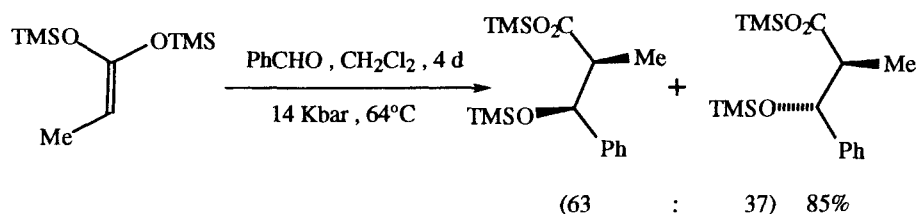


Ballini, R.; Bosica, G. *Tetrahedron*, **1997**, 53, 16131.

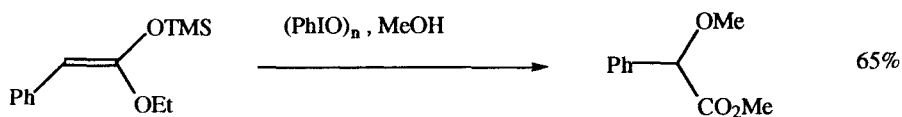
Also via Dicarboxylic Acids:  
Hydroxy-esters  
Diols

Section 312 (Carboxylic Acids - Carboxylic Acids)  
Section 327 (Alcohol - Ester)  
Section 323 (Alcohol - Alcohol)

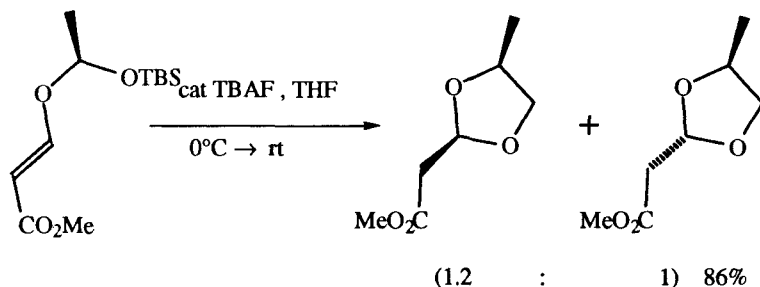
## SECTION 358: ESTER - ETHER, EPOXIDE, THIOETHER



Bellassoued, M.; Reboul, E.; Dumas, E. *Tetrahedron Lett.*, **1997**, 38, 5631.

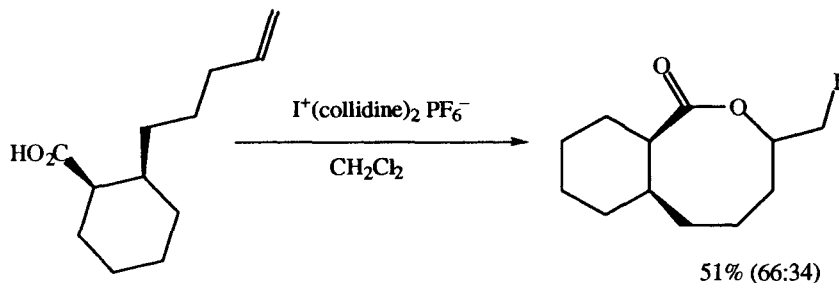


Moriarty, R.M.; Rani, N.; Condeiu, C.; Duncan, M.P.; Prakash, O. *Synth. Commun.*, **1997**, 27, 3273.

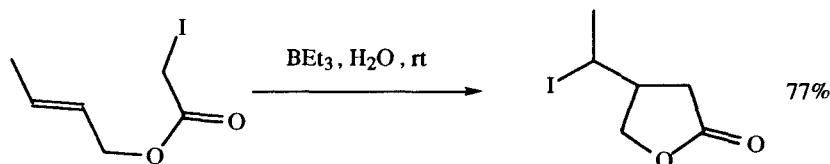


Evans, P.A.; Garber, L.T. *Tetrahedron Lett.*, **1996**, 37, 2927.

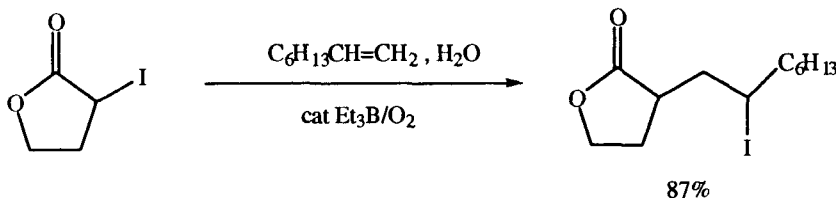
## SECTION 359: ESTER - HALIDE, SULFONATE



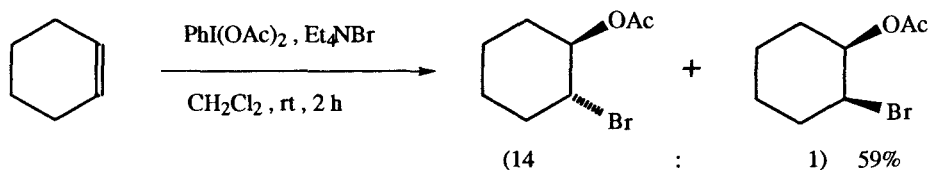
Homs, F.; Rousseau, G. *J. Org. Chem.*, **1998**, 63, 5255.



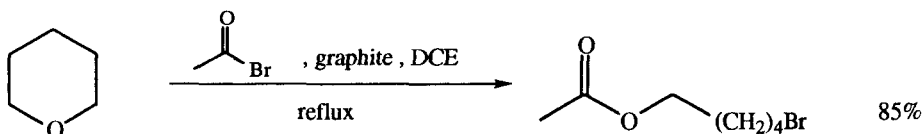
Yorimitsu, H.; Nakamura, T.; Shinokubo, H.; Oshima, K. *J. Org. Chem.*, **1998**, 63, 8604.



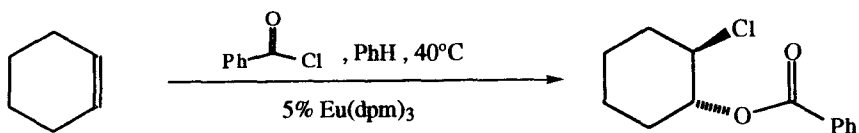
Nakamura, T.; Yorimitsu, H.; Shinokubo, H.; Oshima, K. *SynLett.*, **1998**, 1351.



Hashem, Md.A.; Jung, A.; Ries, M.; Kirschning, A. *SynLett.*, **1998**, 195.

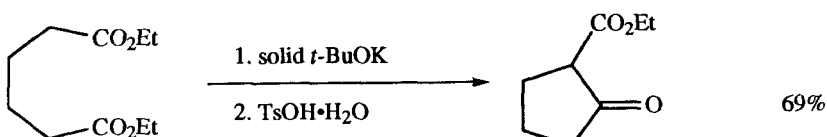


Suzuki, Y.; Matsushima, M.; Kodomari, M. *Chem. Lett.*, **1998**, 319.



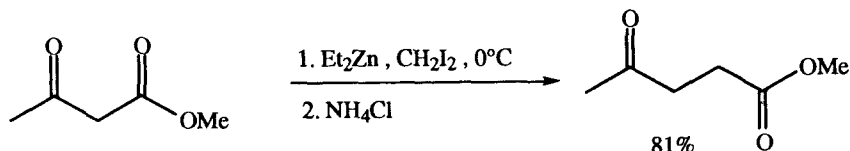
Taniguchi, Y.; Tanbaka, S.; Kitamura, T.; Fujiwara, Y. *Tetrahedron Lett.*, **1998**, 39, 4559.

## SECTION 360: ESTER - KETONE

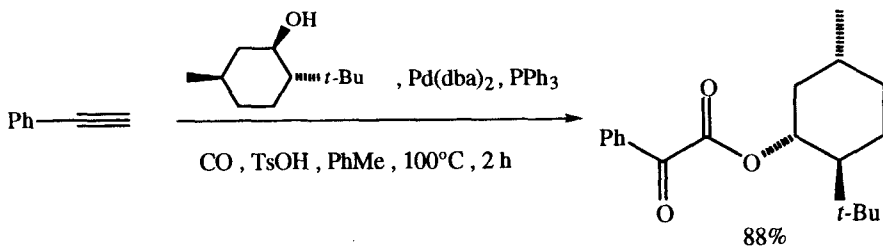


solvent free Dieckmann

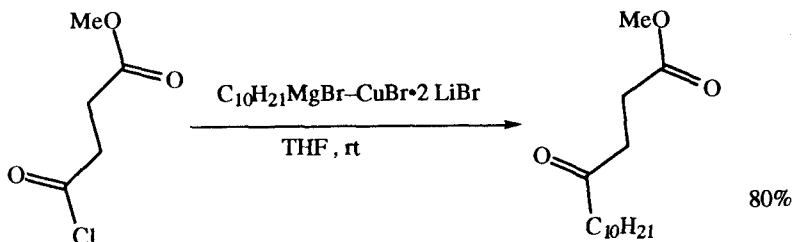
Toda, E.; Suzuki, Y.; Higa, S. *J. Chem. Soc., Perkin Trans. 1*, **1998**, 3521.



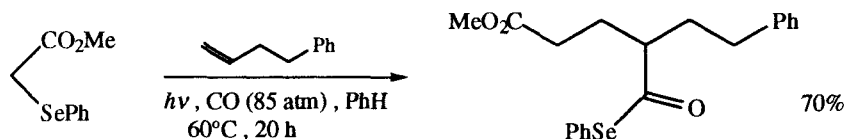
Brogan, J.B.; Zercher, C.K. *J. Org. Chem.*, **1997**, 62, 6444.



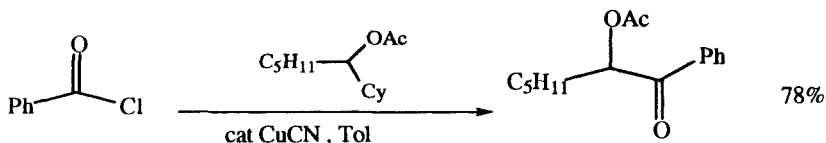
Monteiro, A.L.; Lando, V.R.; Gasparini, V. *Synth. Commun.*, **1997**, 27, 3605.



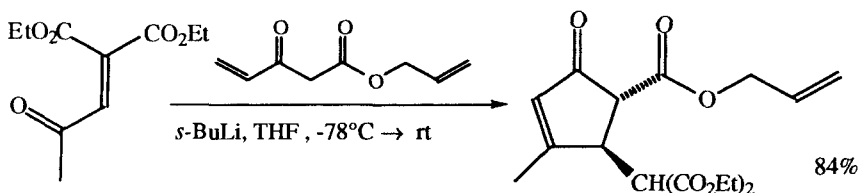
Babudri, F.; Fiandanese, V.; Marchese, G.; Punzi, A. *Tetrahedron*, **1996**, 52, 13513.



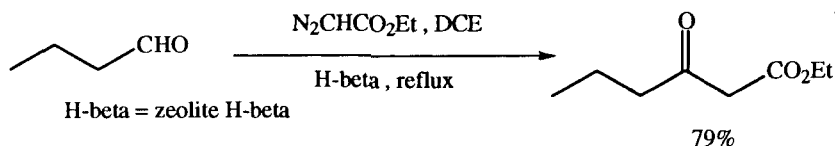
Ryu, I.; Muraoka, H.; Kambe, N.; Komatsu, M.; Sonoda, N. *J. Org. Chem.*, **1996**, 61, 6396



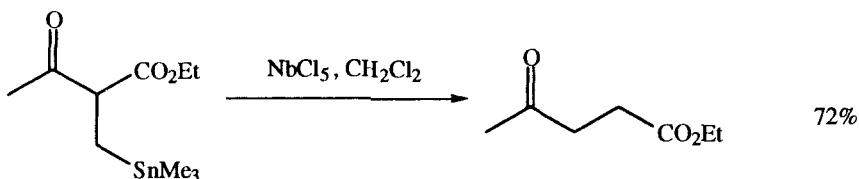
Linderman, R.J.; Siedlecki, J.M. *J. Org. Chem.*, **1996**, 61, 6492.



Hatanaka, M.; Ishida, A.; Tanaka, Y.; Ueda, I. *Tetrahedron Lett.*, **1996**, 37, 401.



Sudrik, S.Gtra, R.B.; Sonawane, H.R. *SynLett.*, **1996**, 369.



Yamamoto, M.; Nakazawa, M.; Kishikawa, K.; Kohmoto, S. *Chem. Commun.*, **1996**, 2353.

Also via Keto acids  
Hydroxy ketones

Section 320 (Carboxylic Acid - Ketone)  
Section 330 (Alcohol - Ketone)

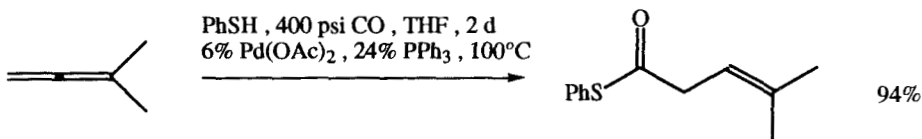
## SECTION 361: ESTER - NITRILE

NO ADDITIONAL EXAMPLES

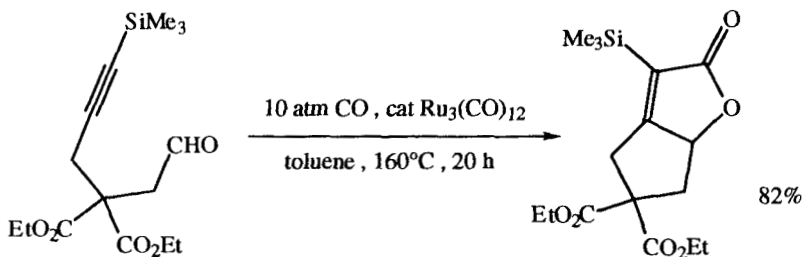


## SECTION 362: ESTER - ALKENE

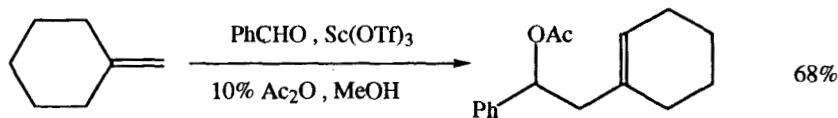
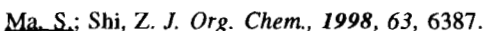
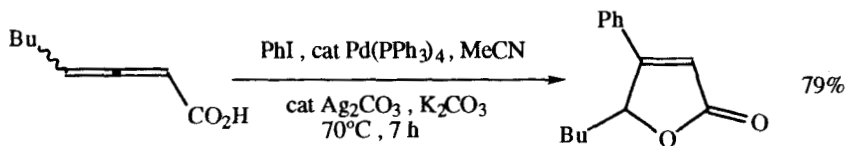
This section contains syntheses of enol esters and esters of unsaturated acids as well as ester molecules bearing a remote alkenyl unit.



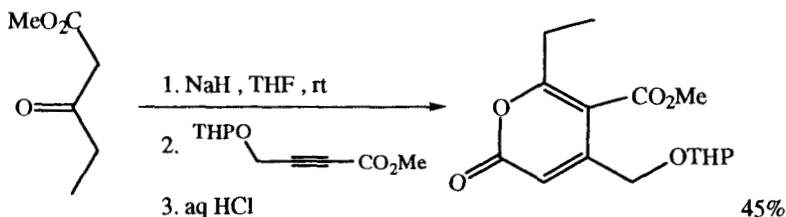
Xiao, W.-J.; Vasapollo, G.; Alper, H. *J. Org. Chem.*, **1998**, *63*, 2609.



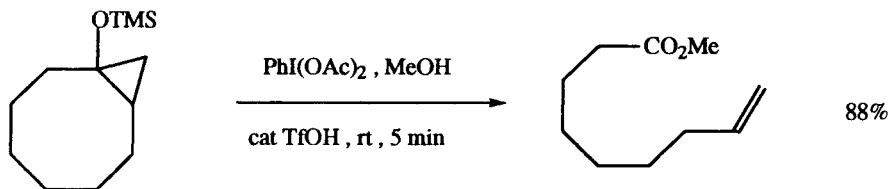
Chatani, N.; Morimoto, T.; Fukumoto, Y.; Murai, S. *J. Am. Chem. Soc.*, **1998**, *120*, 5335.



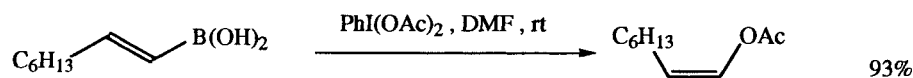
Aggarwal, V.K.; Vennall, G.P.; Davey, P.N.; Newman, C. *Tetrahedron Lett.*, **1998**, 39, 1997.



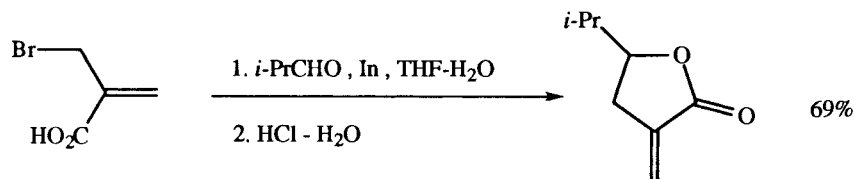
Covarrubias-Zúñiga, A.; Maldonado, L.A.; Díaz-Domínguez, J.  
*Synth. Commun.*, 1998, 28, 1531.



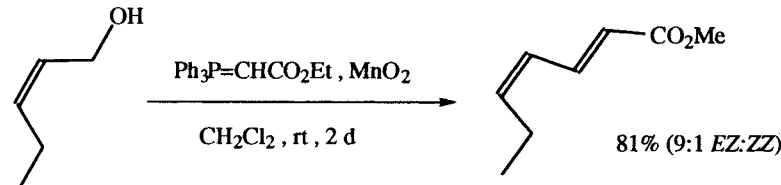
Kirihara, M.; Yokoyama, S.; Momose, T. *Synth. Commun.*, **1998**, 28, 1947.



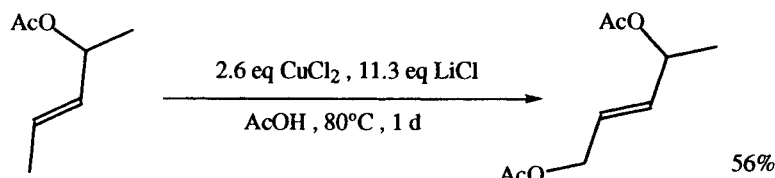
Murata, M.; Satoh, K.; Watanabe, S.; Masuda, Y. *J. Chem. Soc., Perkin Trans. 1*, **1998**, 1465



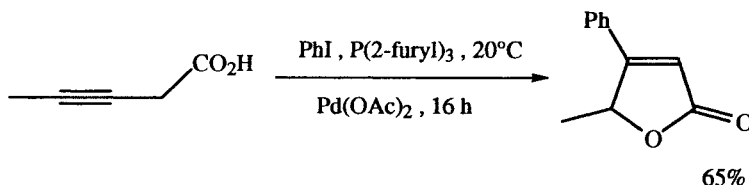
Choudhary, R.K.; Foubelo, F.; Yus, M. *Tetrahedron Lett.*, **1998**, 39, 3581.



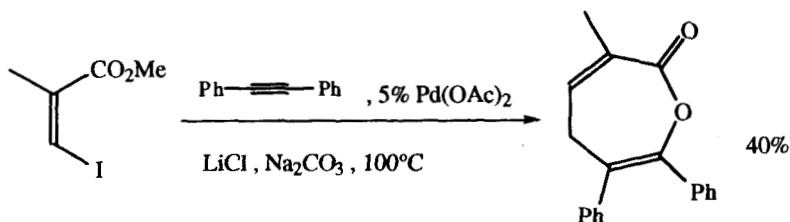
Wei, X.; Taylor, R.J.K. *Tetrahedron Lett.*, **1998**, 39, 3815.



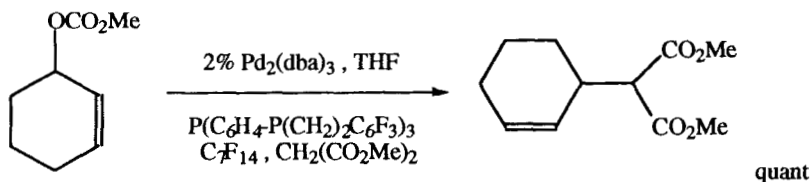
Macsóri, I.; Szabó, K.J. *Tetrahedron Lett.*, **1998**, 39, 6345.



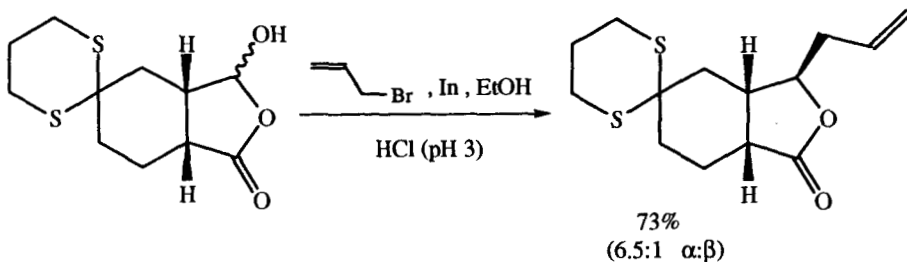
Rossi, R.; Bellina, E.; Biagetti, M.; Mannina, L. *Tetrahedron Lett.*, **1998**, 39, 7599.



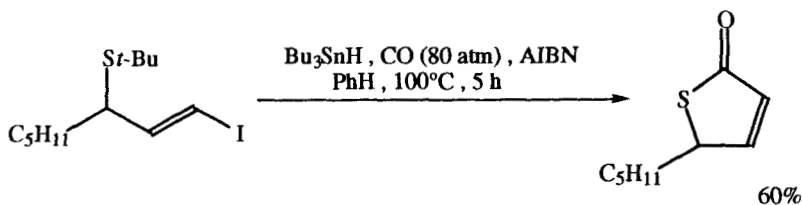
Larock, R.C.; Han, X.; Doty, M.J. *Tetrahedron Lett.*, **1998**, 39, 5713.



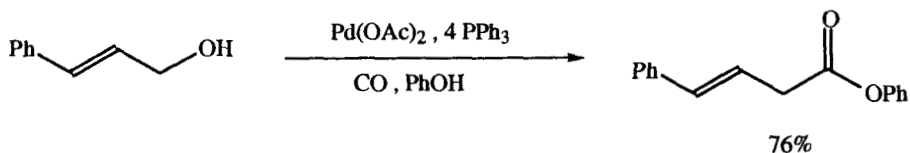
Kling, R.; Sinou, D.; Pozzi, G.; Choplin, A.; Quignard, F.; Busch, S.; Kainz, S.; Koch, D.; Leitner, W. *Tetrahedron Lett.*, **1998**, 39, 9439.



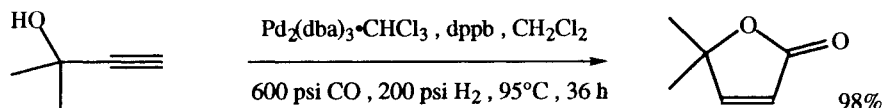
Bernardelli, P.; Paquette, L.A. *J. Org. Chem.*, **1997**, 62, 8284.



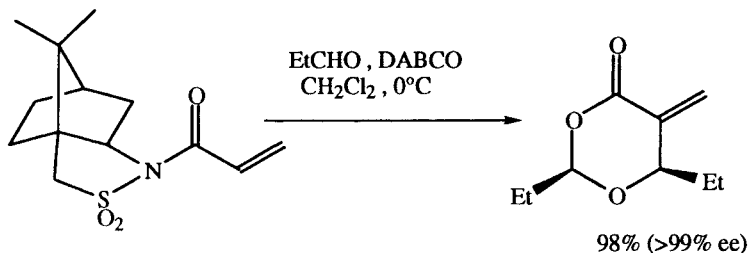
Ryu, I.; Okuda, T.; Nagahara, K.; Kambe, N.; Komatsu, M.; Sonoda, N. *J. Org. Chem.*, **1997**, 62, 7550.



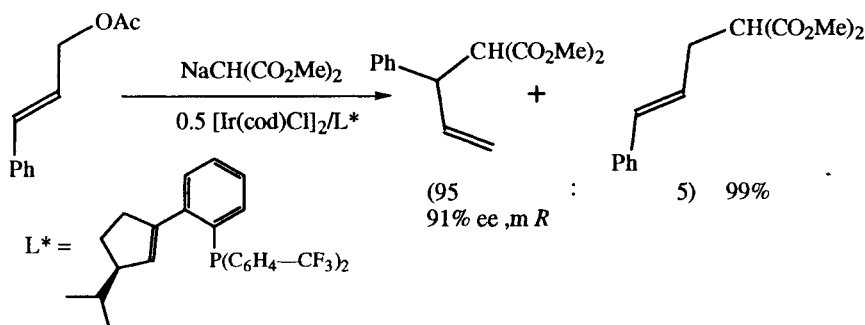
Satoh, T.; Ikeda, M.; Kushino, Y.; Miura, M.; Nomura, M. *J. Org. Chem.*, **1997**, 62, 2662.



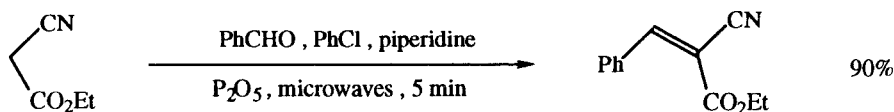
Yu, W.-Y.; Alper, H. *J. Org. Chem.*, **1997**, 62, 5684.



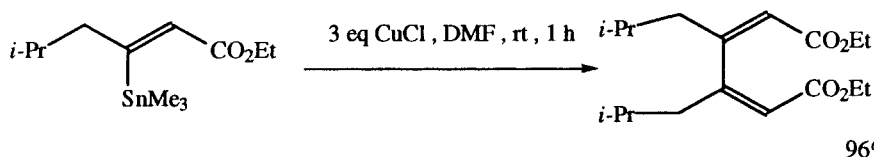
Brzezinski, L.J.; Rafel, S.; Leahy, J.W. *J. Am. Chem. Soc.*, **1997**, 119, 4317.



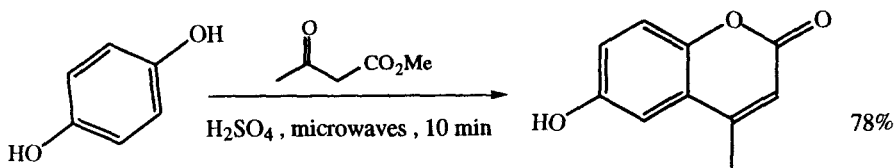
Janssen, J.P.; Helmchen, G. *Tetrahedron Lett.*, **1997**, 38, 8025.



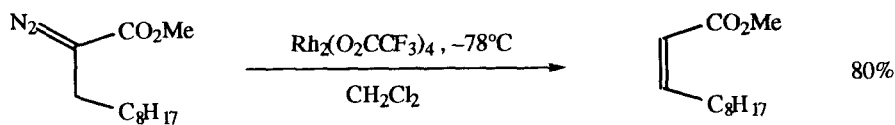
Kim, S.-Y.; Kwon, P.S.; Kwon, T.-W.; Chung, S.-K.; Chang, Y.-T. *Synth. Commun.*, **1997**, 27, 533.



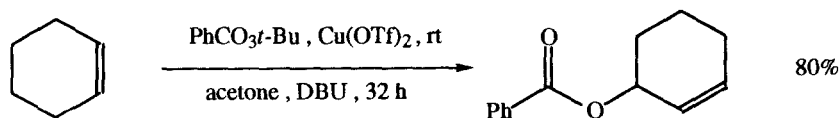
Piers, E.; McEachern, E.J.; Romero, M.A.; Gladstone, P.L. *Can. J. Chem.*, **1997**, 75, 694.



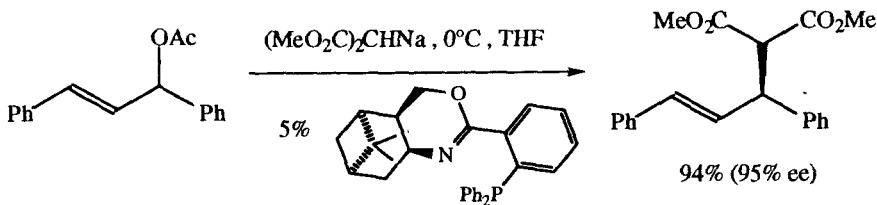
Singh, V.; Singh, J.; Kaur, K.P.; Kad, G.L. *J. Chem. Res. (S)*, **1997**, 58.



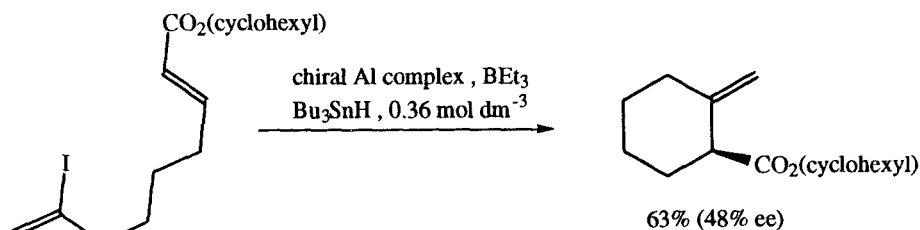
Taber, D.E.; Herr, R.J.; Pack, S.K.; Geremia, J.M. *J. Org. Chem.*, **1996**, 61, 2908.



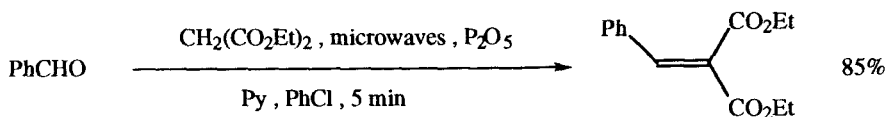
Sekar, G.; Datta Gupta, A.; Singh, V.K. *Tetrahedron Lett.*, **1996**, 37, 8435.



Evans, P.A.; Brandt, T.A. *Tetrahedron Lett.*, **1996**, 37, 9143.



Nishida, M.; Hayashi, H.; Nishida, A.; Kawahara, N. *Chem. Commun.*, **1996**, 579.



Kim, J.-K.; Kwon, P.-S.; Kwon, T.-W.; Chung, S.-K.; Lee, J.-W. *Synth. Commun.*, **1996**, 26, 535.

Related Methods:

Section 60A (Protection of Aldehydes).

Section 180A (Protection of Ketones).

Also via Acetylenic Esters:

Section 306 (Alkyne - Ester).

Alkenyl Acids:

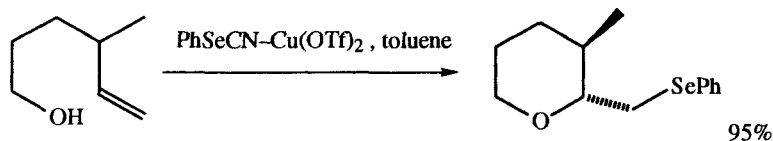
Section 322 (Carboxylic Acid - Alkene).

$\beta$ -Hydroxy-esters:

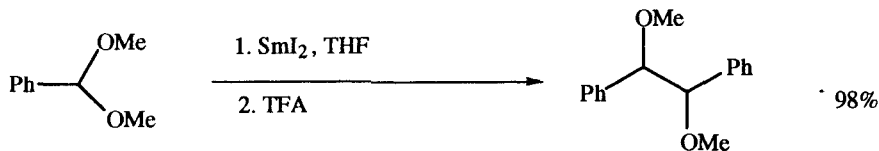
Section 327 (Alcohol - Ester).

## SECTION 363: ETHER, EPOXIDE, THIOETHER - ETHER, EPOXIDE, THIOETHER

See Section 60A (Protection of Aldehydes) and Section 180A (Protection of Ketones) for reactions involving formation of Acetals and Ketals.

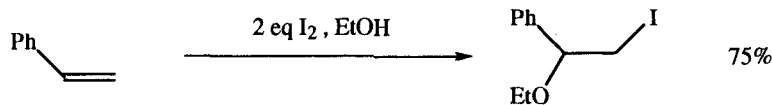


Inoue, H.; Murata, S. *Heterocycles*, 1997, 45, 847.

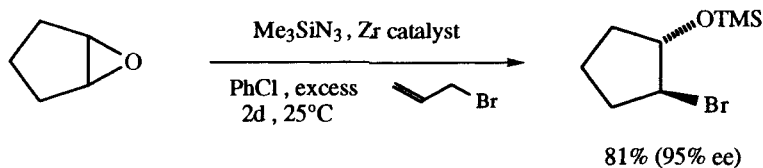


Studer, A.; Curran, D.P. *SynLett.*, 1996, 255.

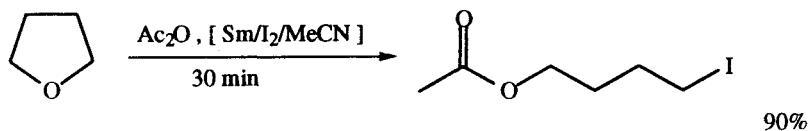
## SECTION 364: ETHER, EPOXIDE, THIOETHER - HALIDE, SULFONATE



Sanseverino, A.M.; de Mattos, M.C.S. *Synthesis*, 1998, 1584.

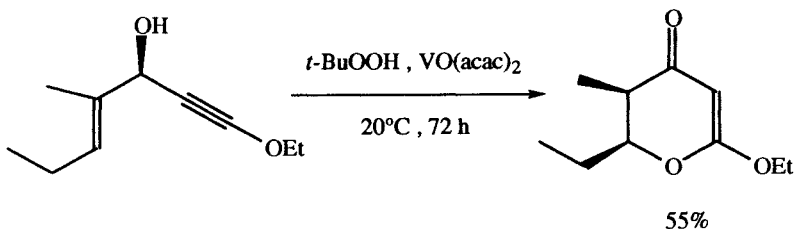


Nugent, W.A. *J. Am. Chem. Soc.*, 1998, 120, 7139.

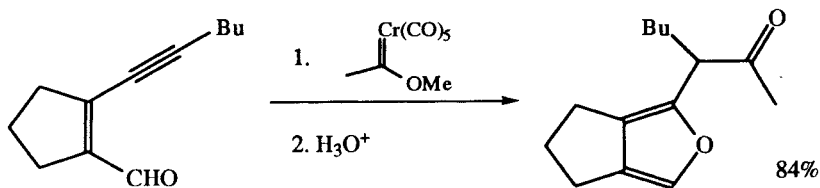


Bao, W.; Ying, T.; Zhang, Y.; Yu, M. *Org. Prep. Proceed. Int.*, **1997**, 29, 335.

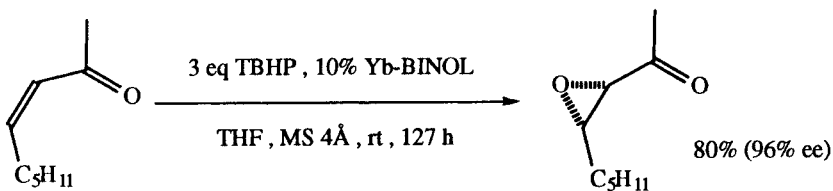
## SECTION 365: ETHER, EPOXIDE, THIOETHER - KETONE



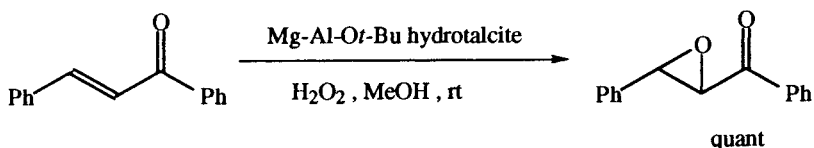
Marson, C.M.; Harper, S.; Oare, C.A. *J. Org. Chem.*, **1998**, 63, 3798.



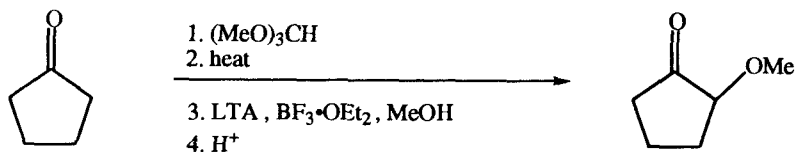
Herndon, J.W.; Wang, H. *J. Org. Chem.*, **1998**, 63, 4564.



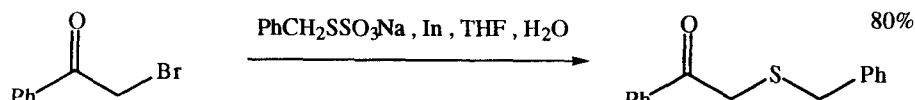
Watanabe, S.; Arai, T.; Sasai, H.; Bougauchi, M.; Shibasaki, M.  
*J. Org. Chem.*, **1998**, 63, 8090.



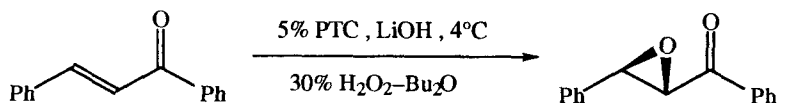
Choudary, B.M.; Kantam, M.L.; Bharathi, B.; Reddy, Ch.V. *SynLett.*, **1998**, 1203.



Singh, V.S.; Singh, C.; Dikshit, D.K. *Synth. Commun.*, **1998**, 28, 45.



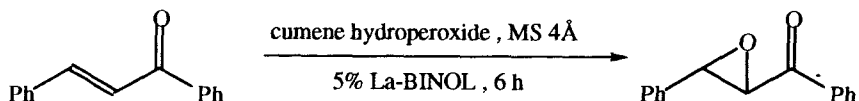
Zhan, Z.; Zhang, Y.; Ma, Z. *J. Chem. Res. (S)*, **1998**, 130.



PTC = a Cinchonium bromide

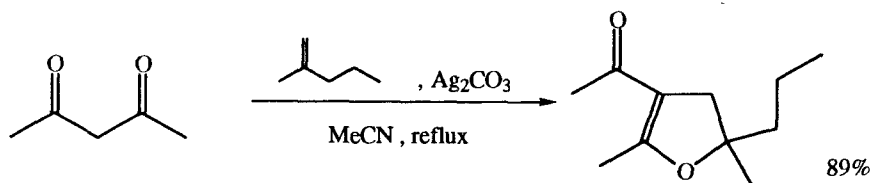
72% (73% ee)

Arai, S.; Tsuge, H.; Shioiri, T. *Tetrahedron Lett.*, **1998**, 39, 7567.

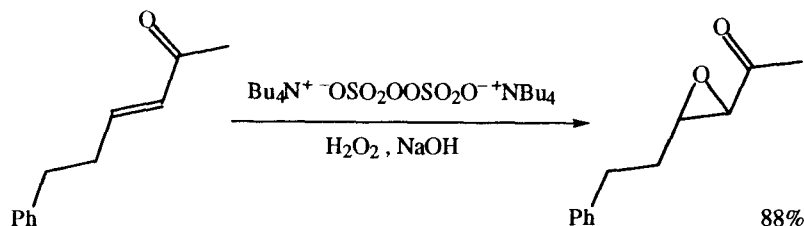


93% (83% ee, SR)

Bougauchi, M.; Watanabe, S.; Arai, T.; Sasai, H.; Shibasaki, M. *J. Am. Chem. Soc.*, **1997**, 119, 2329.

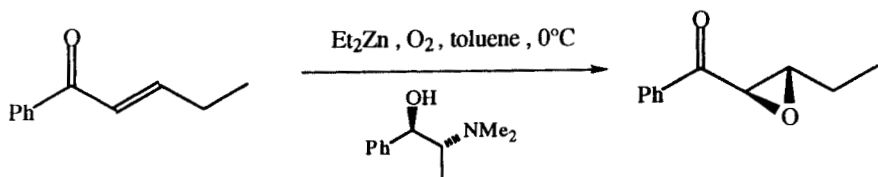
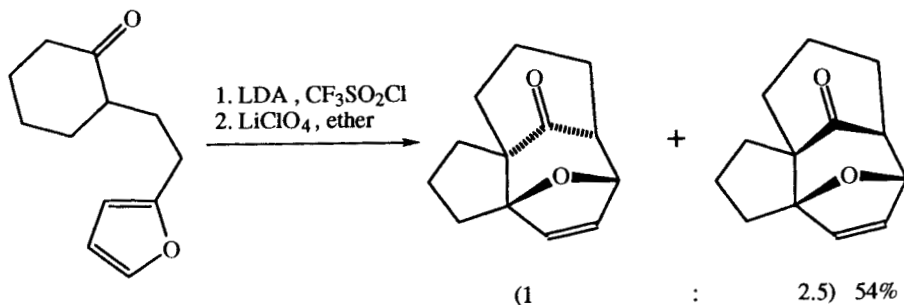
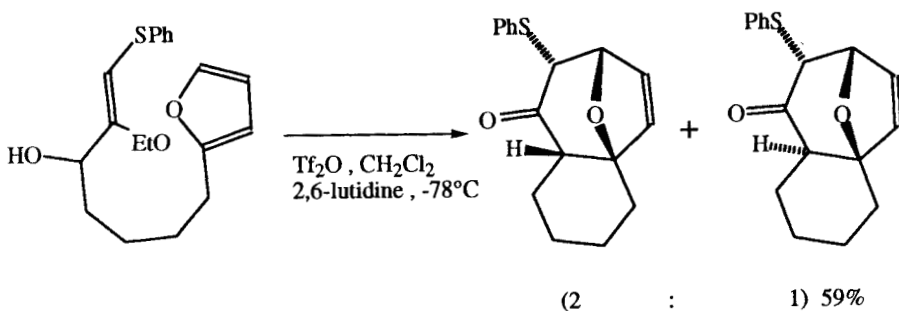
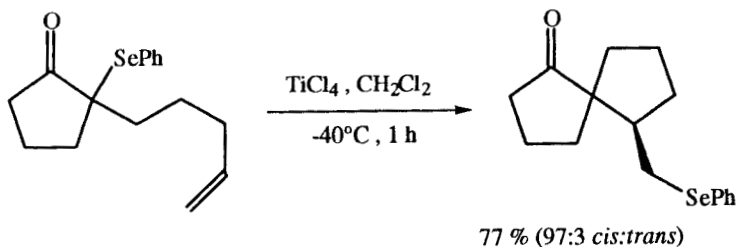


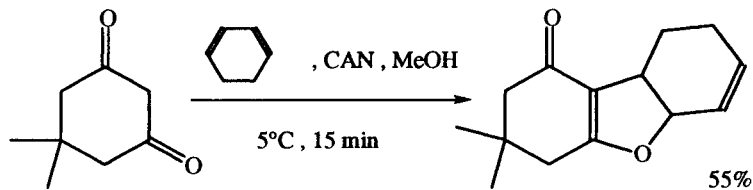
Lee, Y.R.; Kim, B.S. *Tetrahedron Lett.*, **1997**, 38, 2095.



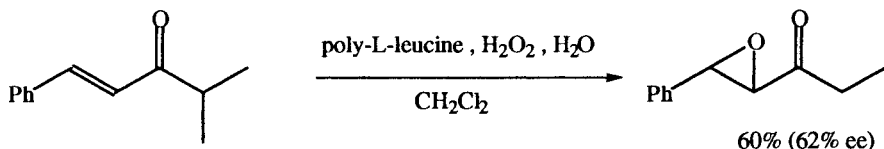
Kim, Y.H.; Hwang, J.P.; Yang, S.G. *Tetrahedron Lett.*, **1997**, 38, 3009.



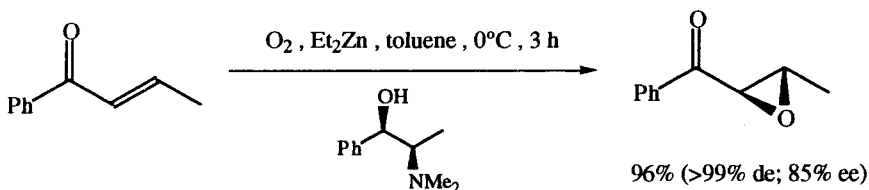
99% (>94% de, 91% ee, *RS*)Enders, D.; Zhu, J.; Kramps, L. *Liebigs Ann. Chem.*, **1997**, 1101.Harmata, M.; Elomari, S.; Barnes, C.L. *J. Am. Chem. Soc.*, **1996**, 118, 2860.Harmata, M.; Jones, D.E. *Tetrahedron Lett.*, **1996**, 37, 783.Toru, T.; Kawai, S.; Ueno, Y. *SynLett.*, **1996**, 539.



Nair, V.; Mathew, J.; Nair, L.G. *Synth. Commun.*, **1996**, 26, 4531.

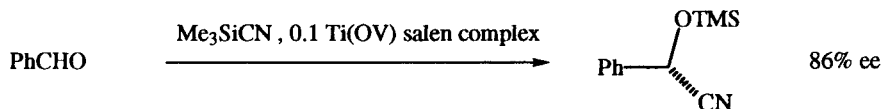


Kroutil, W.; Lasterra-Sánchez, M.; Maddrell, S.J.; Mayon, P.; Morgan, P.; Roberts, S.M.; Thornton, S.R.; Todd, C.J.; Tüter, M. *J. Chem. Soc., Perkin Trans. 1*, **1996**, 2837.

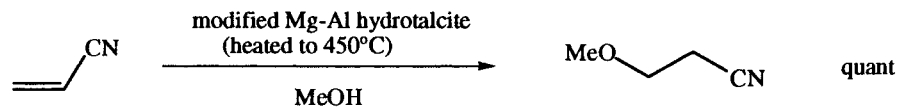


Enders, D.; Zhu, J.; Raabe, G. *Angew. Chem. Int. Ed.*, **1996**, 35, 1725.

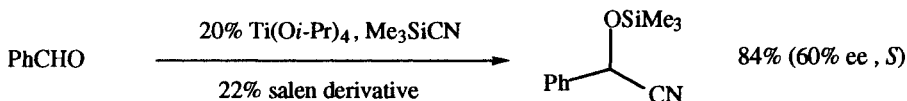
## SECTION 366: ETHER, EPOXIDE, THIOETHER - NITRILE



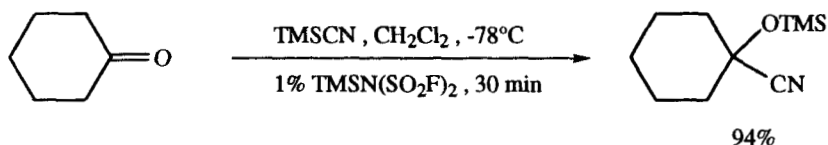
Tararov, V.I.; Hibbs, D.E.; Hursthouse, M.B.; Ikonnikov, N.S.; Malik, K.M.A.; North, M.; Orlizu, C.; Belokon, Y.N. *Chem. Commun.*, **1998**, 387.



Kumbhar, P.S.; Sanchez-Valente, J.; Figueras, E. *Chem. Commun.*, **1998**, 1091.



Belokon, Y.; Flego, M.; Ikonnikov, N.S.; Moscalenko, M.; North, M.; Orlizu, C.; Tararov, V. *J. Chem. Soc., Perkin Trans. 1*, **1997**, 1293.



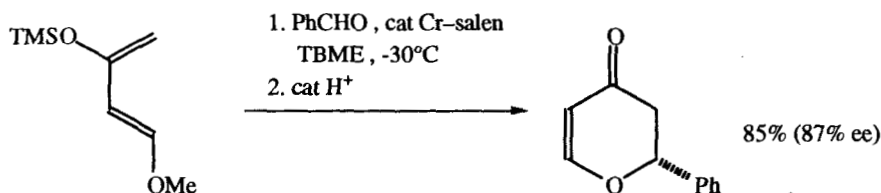
Kaur, H.; Kaur, G.; Trehan, S. *Synth. Commun.*, **1996**, 26, 1925.

# REVIEW:

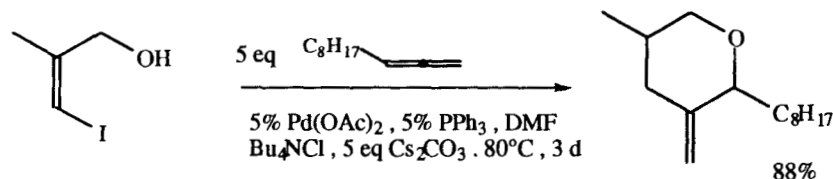
"Sulfoximine–Titanium Reagents in Enantioselective Trimethylsilylcyanations of Aldehydes  
 Bolm, C.; Müller, P.; Harms, K. *Acta Chem. Scand. B*, **1996**, 50, 305.

## SECTION 367: ETHER, EPOXIDE, THIOETHER - ALKENE

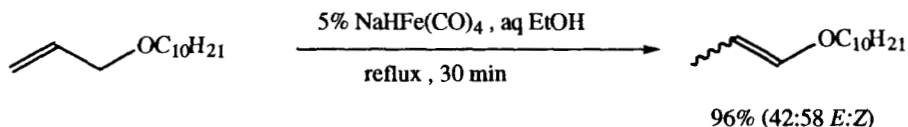
Enol ethers are found in this section as well as alkenyl ethers.



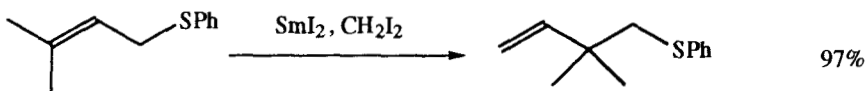
Schaus, S.E.; Brånalt, J.; Jacobsen, E.N. *J. Org. Chem.*, **1998**, 63, 403.



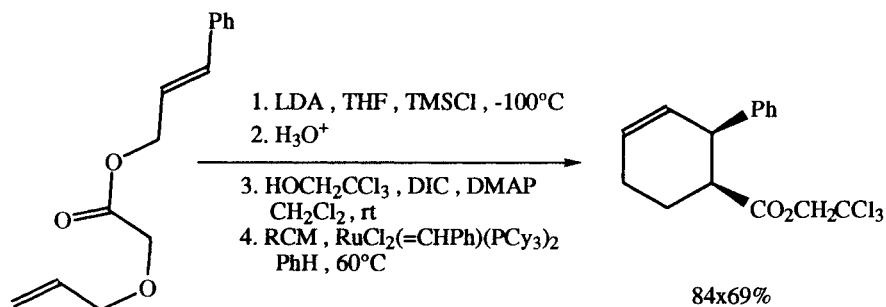
Larock, R.C.; He, Y.; Leong, W.W.; Han, X.; Refvik, M.D.; Zenner, J.M.  
*J. Org. Chem.*, **1998**, 63, 2154.



Crivello, J.V.; Kong, S. *J. Org. Chem.*, **1998**, 63, 6745.

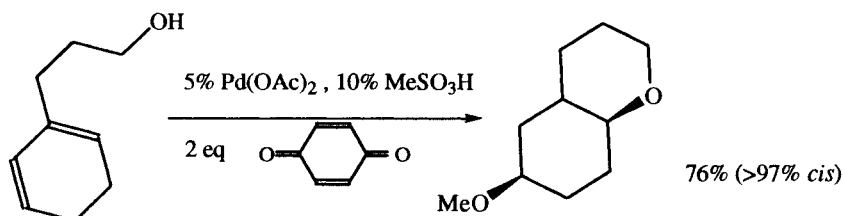


Kunishima, M.; Nakata, D.; Goto, C.; Hioki, K.; Tani, S. *SynLett.*, **1998**, 1366.

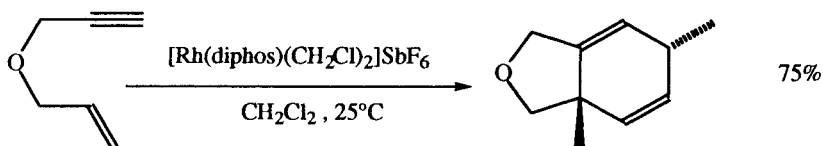


tandem Claisen rearrangement

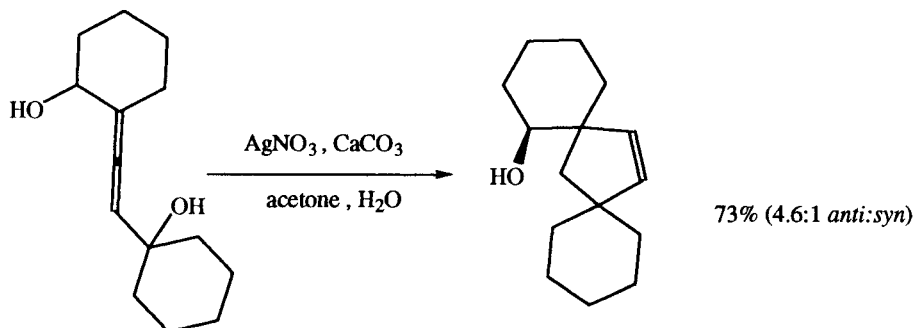
Burke, S.D.; Ng, R.A.; Morrison, J.A.; Alberti, M.J. *J. Org. Chem.*, **1998**, 63, 3160.



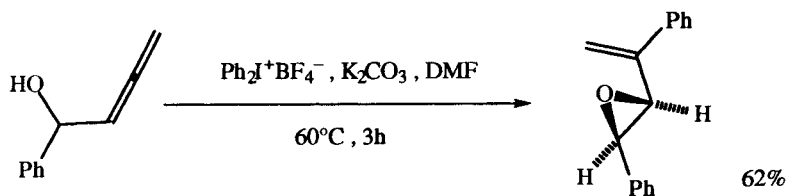
Itami, K.; Palmgren, A.; Bäckvall, J.-E. *Tetrahedron Lett.*, **1998**, 39, 1223.



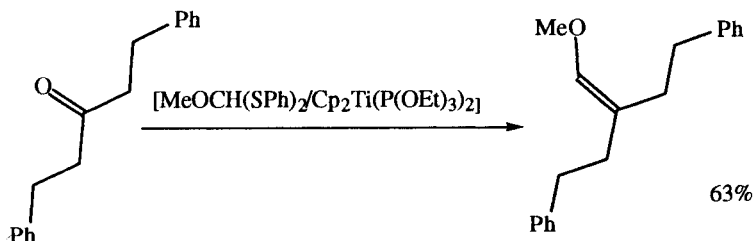
Gilbertson, S.R.; Hoge, G.S. *Tetrahedron Lett.*, **1998**, 39, 2075.



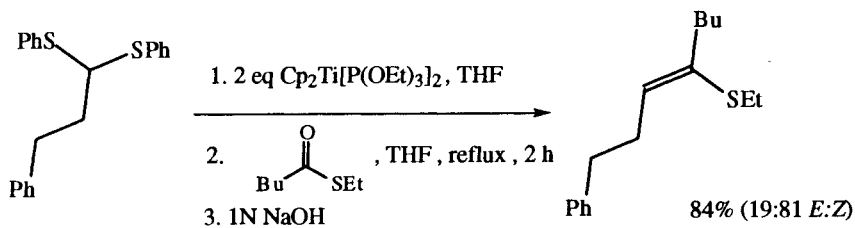
Aurrecoechea, J.M.; Solay, M. *Tetrahedron*, **1998**, 54, 3851.



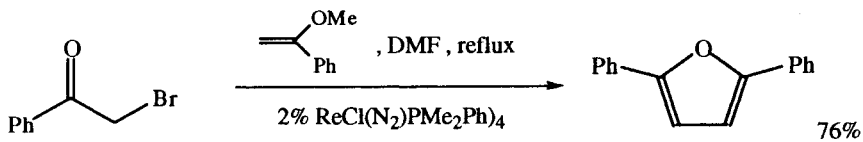
Kang, S.-K.; Yamaguchi, T.; Pyun, S.-J.; Lee, Y.-T.; Baik, T.-G. *Tetrahedron Lett.*, **1998**, 39, 2127.



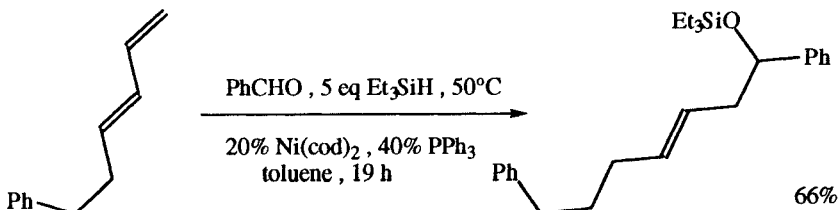
Rahim, Md.A.; Taguchi, H.; Watanabe, M.; Fujiwara, T.; Takeda, T. *Tetrahedron Lett.*, **1998**, 39, 2153.



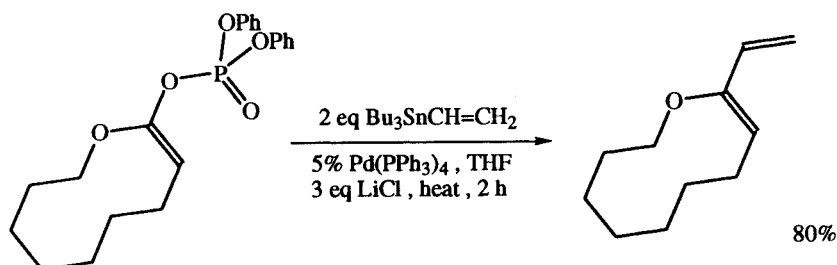
Takeda, T.; Watanabe, M.; Nozaki, N.; Fujiwara, T. *Chem. Lett.*, **1998**, 115.



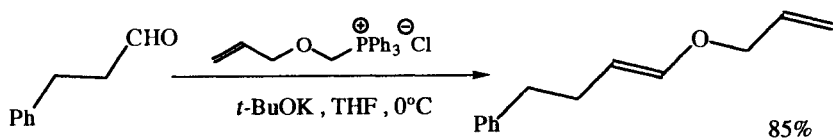
Koga, Y.; Kusama, H.; Narasaka, K. *Bull. Chem. Soc. Jpn.*, **1998**, 71, 475.



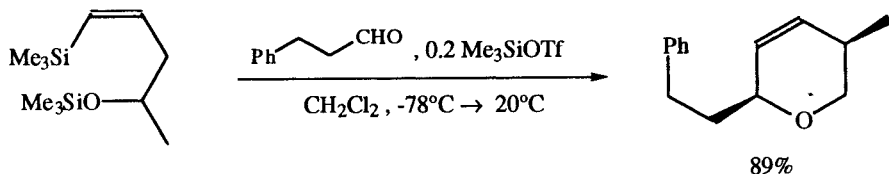
Takimoto, M.; Hiraga, Y.; Sato, Y.; Mori, M. *Tetrahedron Lett.*, **1998**, 39, 4543.



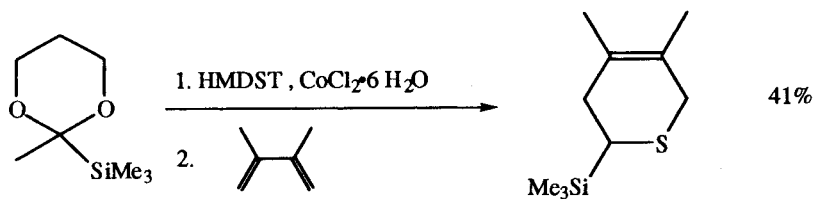
Nicolaou, K.C.; Shi, G.-Q.; Gunzner, J.L.; Gärtner, P.; Yang, Z.  
*J. Am. Chem. Soc.*, **1997**, *119*, 5467.



Kulkarni, M.G.; Pendharkar, D.S.; Rasne, R.M. *Tetrahedron Lett.*, **1997**, *38*, 1459.

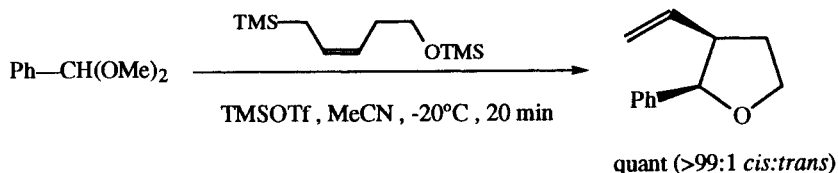


Markó, I.E.; Dobbs, A.P.; Scheirmann, V.; Chellé, F.; Bayston, D.J. *Tetrahedron Lett.*, **1997**, *38*, 2899.

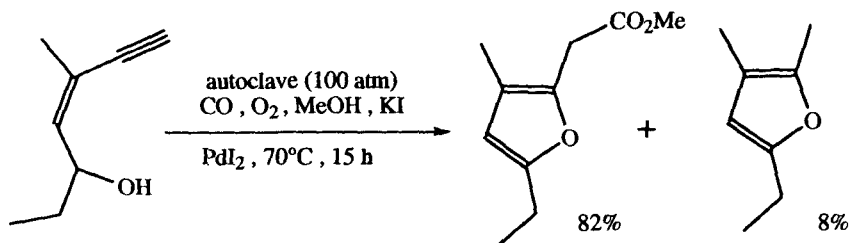


HMDST = hexamethyldisilathiane

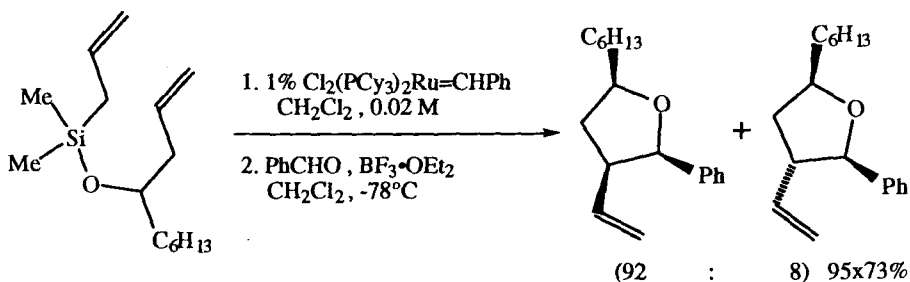
Degl'Innocenti, A.; Scafato, P.; Capperucci, A.; Bartoletti, L.; Spezzacatena, C.; Ruzziconi, R.  
*SynLett.*, **1997**, 361.



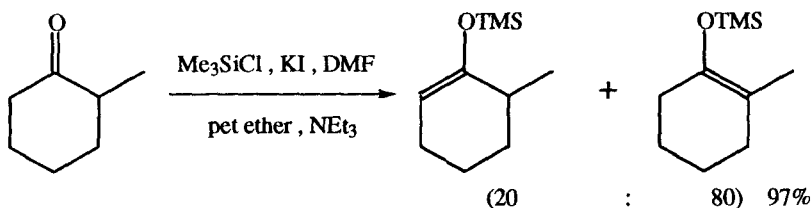
Sano, T.; Oriyama, T. *SynLett.*, **1997**, 716.



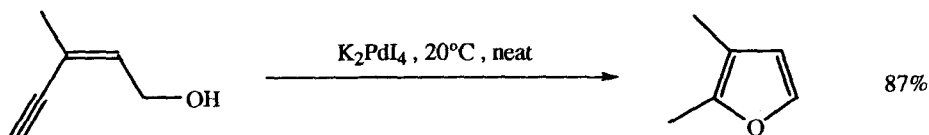
Gabriele, B.; Salerno, G.; DePascali, F.; Scianò, G.T.; Costa, M.; Chiusoli, G.P. *Tetrahedron Lett.*, **1997**, 38, 6877.



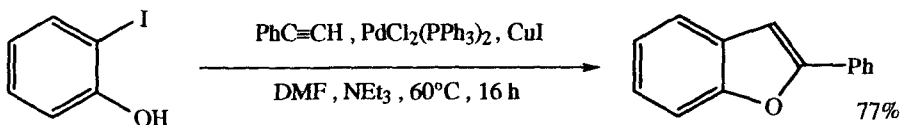
Cassidy, J.H.; Marsden, S.P.; Stemp, G. *SynLett.*, **1997**, 1411.



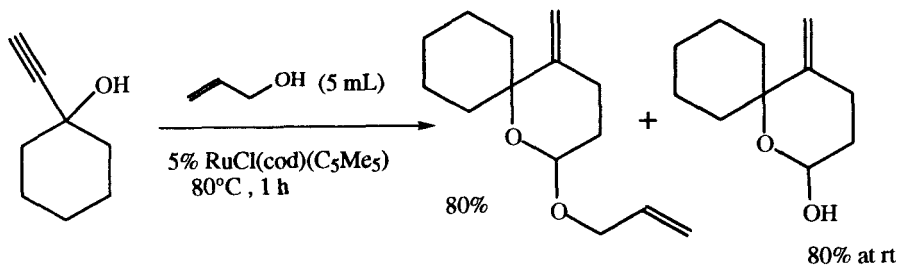
Lin, J.-M.; Liu, B.-S. *Synth. Commun.*, **1997**, 27, 739.



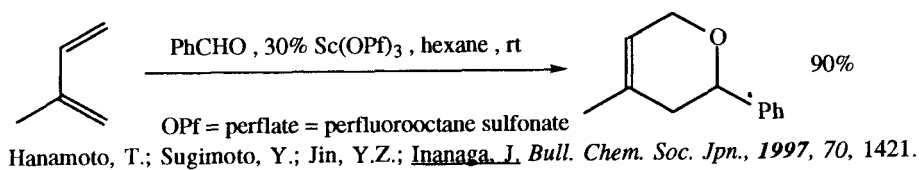
Gabriele, B.; Salerno, G. *Chem. Commun.*, **1997**, 1083.



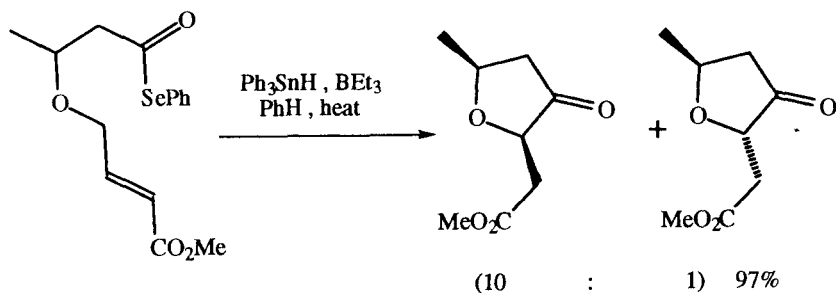
Kundu, N.G.; Pal, M.; Mahanty, J.S.; De, M. *J. Chem. Soc., Perkin Trans. 1*, **1997**, 2815.



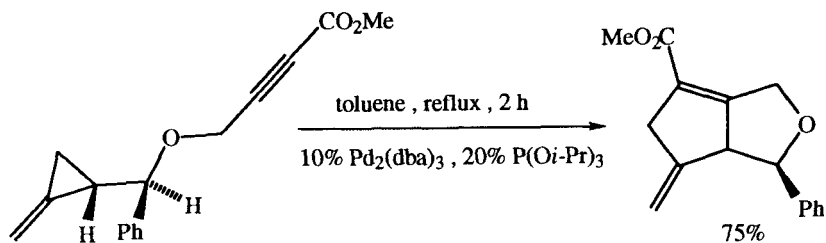
Dérien, S.; Vicente, B.G.; Dixneuf, P.H. *Chem. Commun.*, **1997**, 1405.



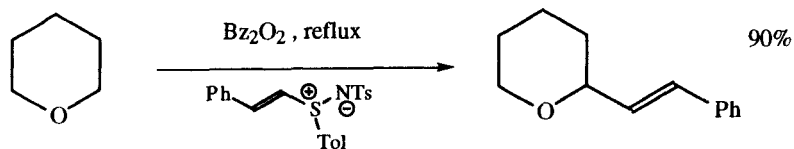
Hanamoto, T.; Sugimoto, Y.; Jin, Y.Z.; Inanaga, J. *Bull. Chem. Soc. Jpn.*, **1997**, 70, 1421.



Evans, P.A.; Roseman, J.D. *J. Org. Chem.*, **1996**, 61, 2252.

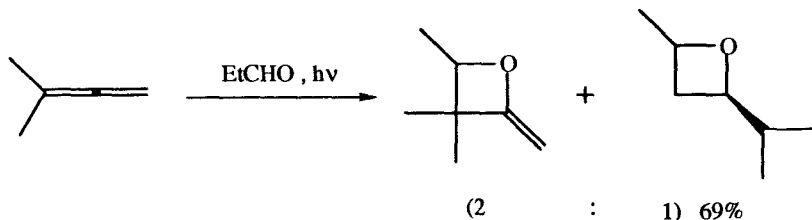


Lautens, M.; Ren, Y. *J. Am. Chem. Soc.*, **1996**, 118, 9597.

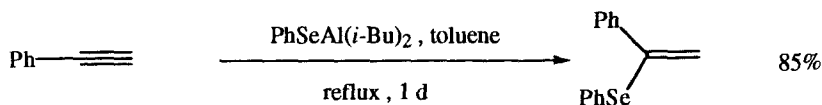


Clark, A.J.; Rooke, S.; Sparey, T.J.; Taylor, P.C. *Tetrahedron Lett.*, **1996**, 37, 909.

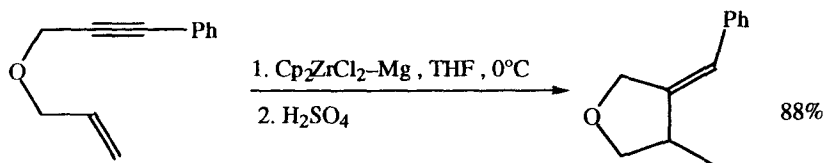




Howell, A.R.; Fan, R.; Truong, A. *Tetrahedron Lett.*, **1996**, 37, 8651.



Dabdoub, M.L.; Cassol, T.M.; Batista, A.C.F. *Tetrahedron Lett.*, **1996**, 37, 9005.



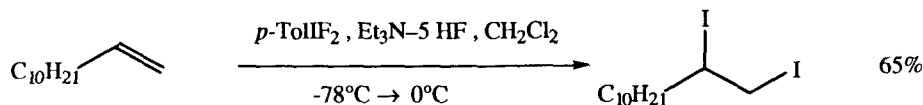
Miura, K.; Funatsu, M.; Saito, H.; Ito, H.; Hosomi, A. *Tetrahedron Lett.*, **1996**, 37, 9059.

Related Methods:

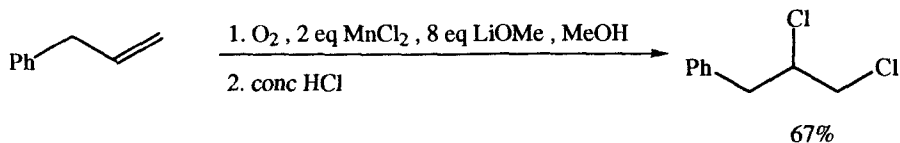
Section 180A (Protection of Ketones)

## SECTION 368: HALIDE, SULFONATE - HALIDE, SULFONATE

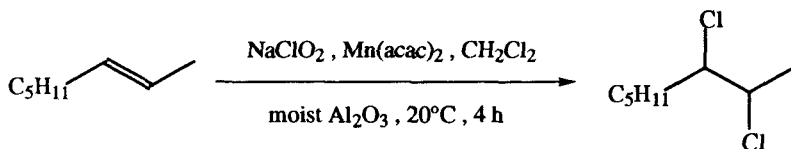
Halocyclopropanations are found in Section 74F (Alkyls from Alkenes).



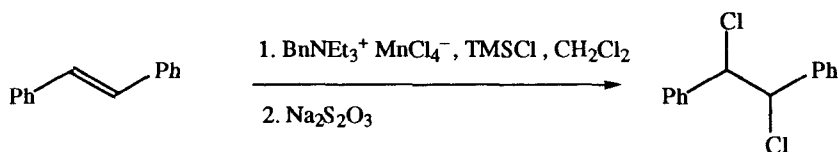
Hara, S.; Nakahigashi, J.; Ishi-i, K.; Sawaguchi, M.; Sakai, H.; Fukuhara, T.; Yoneda, N. *SynLett.*, **1998**, 495.



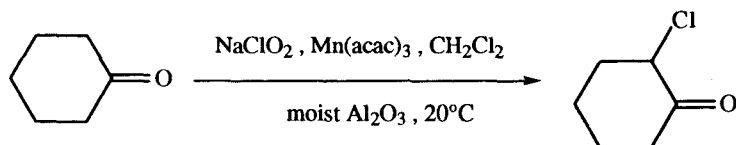
Hojo, M.; Murakami, C.; Ohno, K.; Kuboyama, J.; Nakamura, S.-Y.; Ito, H.; Hosomi, A. *Heterocycles*, **1998**, 47, 97.



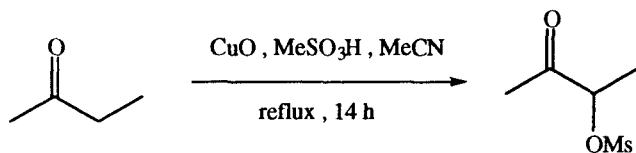
80%

Yakabe, S.; Hirano, M.; Morimoto, T. *Synth. Commun.*, **1998**, *28*, 1871.

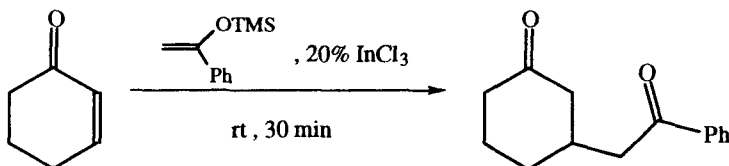
95%

Markó, I.E.; Richardson, P.R.; Bailey, M.; Maguire, A.R.; Coughlan, N. *Tetrahedron Lett.*, **1997**, *38*, 2339.**SECTION 369: HALIDE, SULFONATE - KETONE**

75%

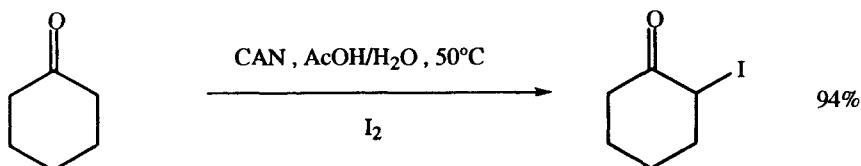
Yakabe, S.; Hirano, M.; Morimoto, T. *Synth. Commun.*, **1998**, *28*, 131.

71%

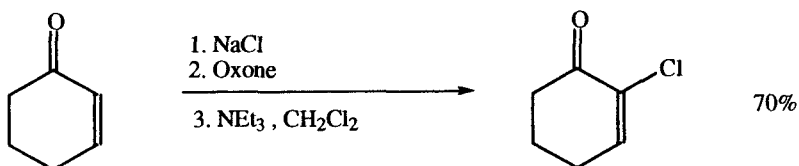
Lee, J.C.; Choi, Y. *Tetrahedron Lett.*, **1998**, *39*, 3171.

67%

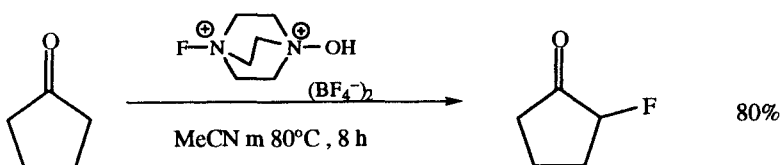
Diwu, Z.; Beachdel, C.; Klaubert, D.H. *Tetrahedron Lett.*, **1998**, *39*, 4987.



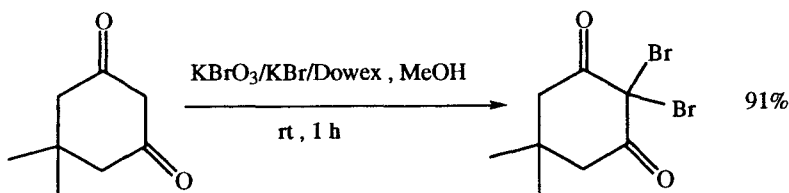
Horiuchi, C.A.; Kiji, S. *Bull. Chem. Soc. Jpn.*, **1997**, 70, 421.



Dieter, R.K.; Nice, L.E.; Velu, S.E. *Tetrahedron Lett.*, **1996**, 37, 2377.

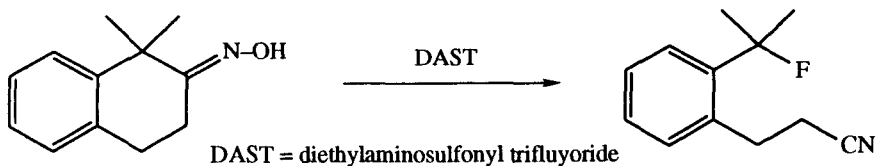


Stavber, S.; Zupan, M. *Tetrahedron Lett.*, **1996**, 37, 3591.



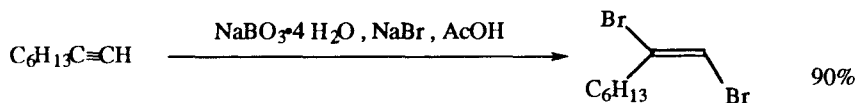
Košmrlj, J.; Kočever, M.; Polanc, S. *Synth. Commun.*, **1996**, 27, 3583.

## SECTION 370: HALIDE, SULFONATE - NITRILE

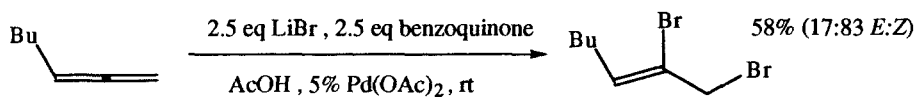


Kirihara, M.; Niimi, K.; Momose, T. *Chem. Commun.*, **1997**, 599.

## SECTION 371: HALIDE, SULFONATE - ALKENE

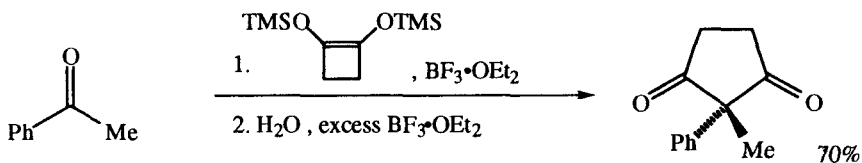


Kabalka, G.W.; Yang, K. *Synth. Commun.*, **1998**, 28, 3807.

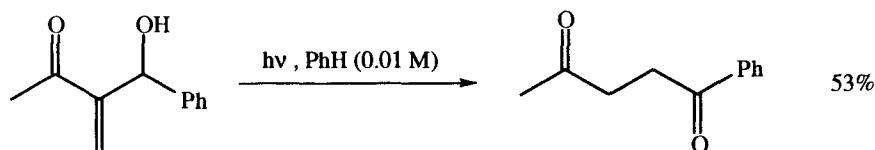


Bäckvall, J.-E.; Jonasson, C. *Tetrahedron Lett.*, **1997**, 38, 291.

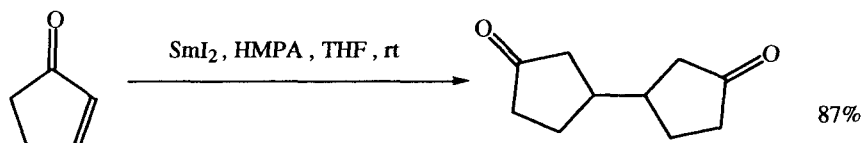
## SECTION 372: KETONE - KETONE



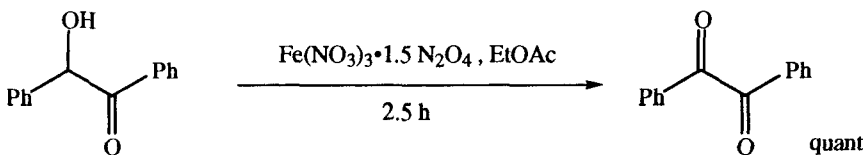
Crane, S.N.; Burnell, D.J. *J. Org. Chem.*, **1998**, 63, 1352.



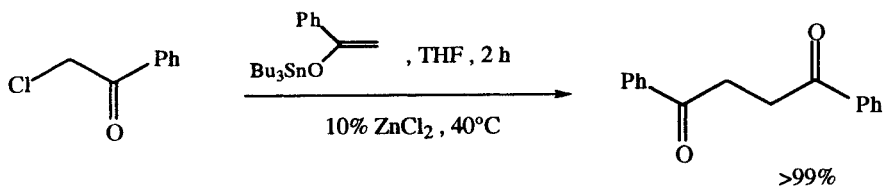
Matsumoto, S.; Okubo, Y.; Mikami, K. *J. Am. Chem. Soc.*, **1998**, 120, 4015.



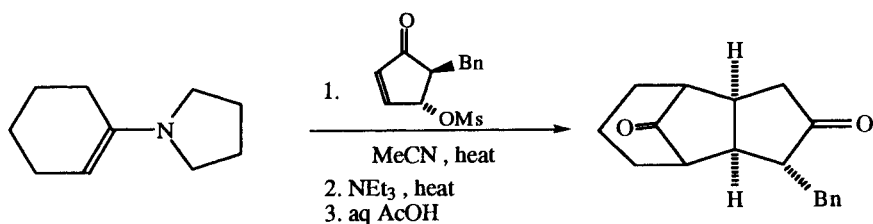
Cabrera, A.; Rosas, N.; Sharma, P.; LeLagade, R.; Velasco, L.; Salmón, M. *Synth. Commun.*, **1998**, 28, 1103.



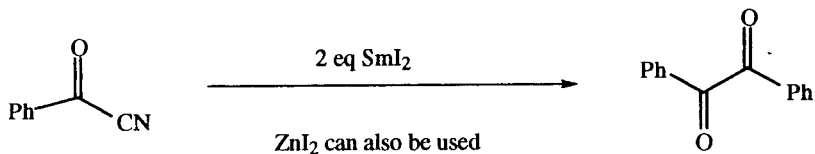
Iranpoor, N.; Firouzabadi, H.; Zolfigol, M.A. *Bull. Chem. Soc. Jpn.*, **1998**, 71, 905.



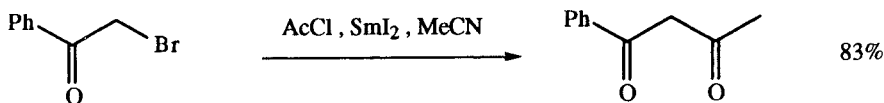
Yasuda, M.; Tsuji, S.; Shibata, I.; Baba, A. *J. Org. Chem.*, **1997**, 62, 8282.



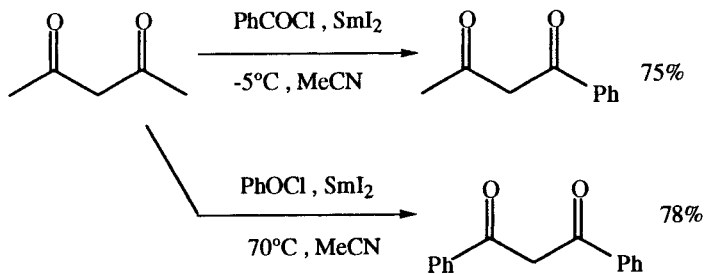
Gunawardena, G.U.; Arif, A.M.; West, F.G. *J. Am. Chem. Soc.*, **1997**, 119, 2066.



Baruah, B.; Boruah, A.; Prajapati, D.; Sandhu, I.S. *Tetrahedron Lett.*, **1997**, 38, 7603.

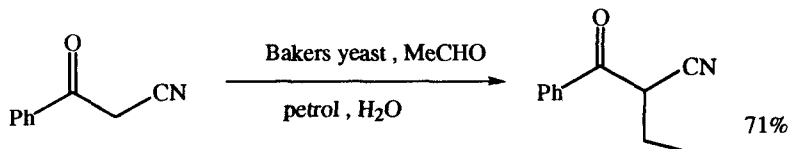


Ying, T.; Bao, W.; Zhang, Y.; Xu, W. *Tetrahedron Lett.*, **1996**, 37, 3885.

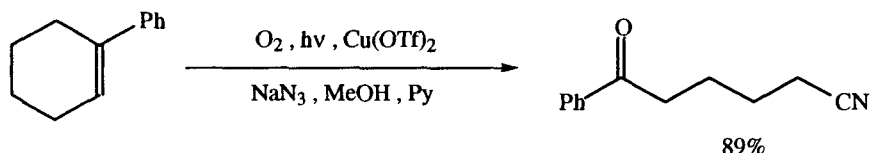


Hao, W.; Zhang, Y.; Ying, T.; Lu, P. *Synth. Commun.*, **1996**, 26, 2421.

## SECTION 373: KETONE - NITRILE



Smallridge, A.J.; Ten, A.; Trehwella, M.A. *Tetrahedron Lett.*, **1998**, 39, 5121.



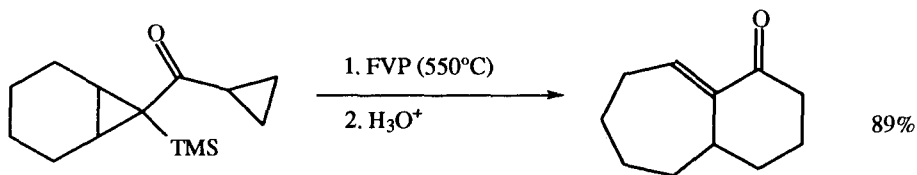
Shimizu, I.; Fujita, M.; Nakajima, T.; Sato, T. *SynLett.*, **1997**, 887.

## SECTION 374: KETONE - ALKENE

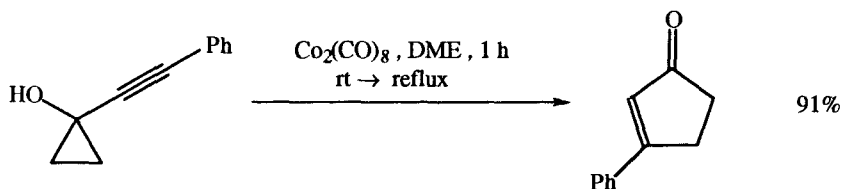
For the oxidation of allylic alcohols to alkene ketones, see Section 168 (Ketones from Alcohols and Phenols)

For the oxidation of allylic methylene groups (C=C-CH<sub>2</sub> → C=C-C=O), see Section 170 (Ketones from Alkyls and Methylene).

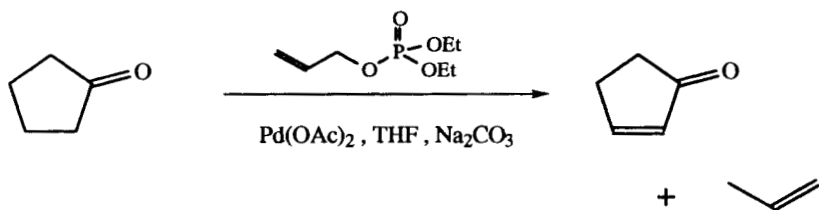
For the alkylation of alkene ketones, also see Section 177 (Ketones from Ketones) and for conjugate alkylations see Section 74E (Alkyls from Alkenes).



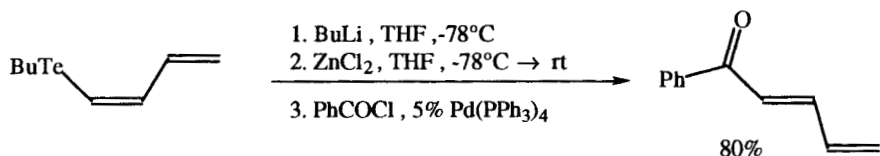
Liu, H.; Shook, C.A.; Jamison, J.A.; Thiruvazhi, M.; Cohen, T. *J. Am. Chem. Soc.*, **1998**, 120, 605.



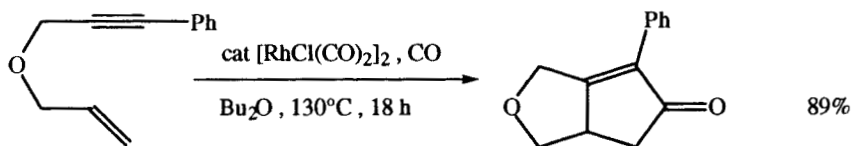
Iwasawa, N.; Matsuo, T.; Iwamoto, M.; Ikeno, T. *J. Am. Chem. Soc.*, **1998**, 120, 3903.



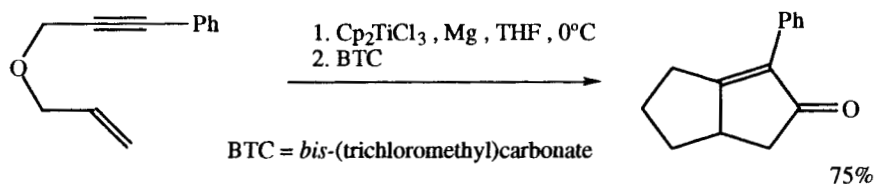
Shyo, Y.; Arisha, A.H.I. *J. Org. Chem.*, **1998**, 63, 5640.



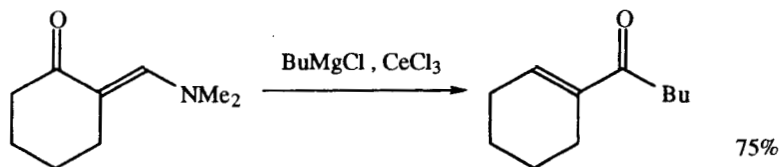
Huang, Y.-Z.; Mo, X.-S. *Tetrahedron Lett.*, **1998**, 39, 1945.



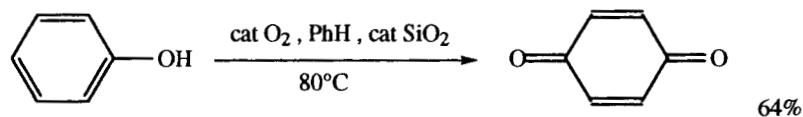
Koga, Y.; Kobayashi, T.; Narasaka, K. *Chem. Lett.*, **1998**, 249.



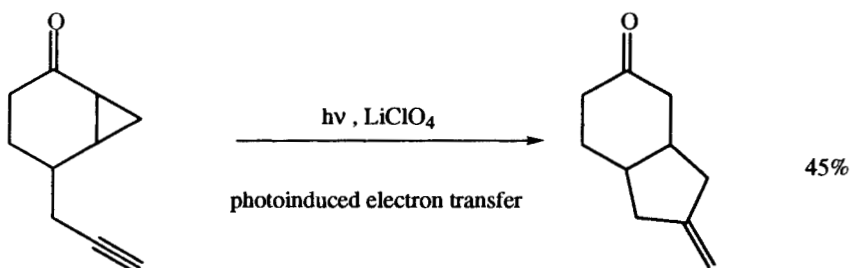
Zhao, Z.; Ding, Y. *J. Chem. Soc., Perkin Trans. I*, **1998**, 171.



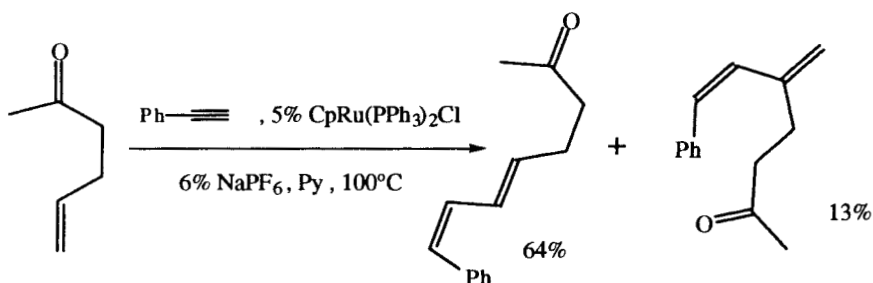
Fonenas, C.; Aït-Haddou, H.; Balavoine, G.G.A. *Synth. Commun.*, **1998**, 28, 1743.



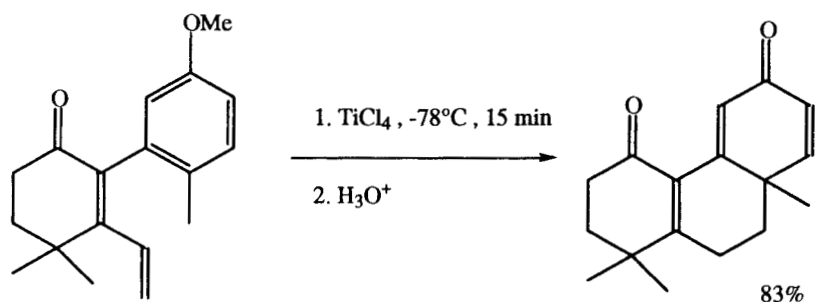
Hashemi, M.M.; Beni, Y.A. *J. Chem. Res. (S)*, **1998**, 138.



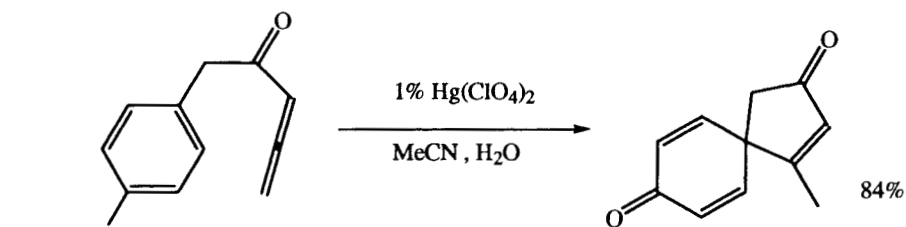
Fagnoni, M.; Schmoldt, P.; Kirschberg, T.; Mattay, J. *Tetrahedron*, **1998**, *54*, 6427.



Murakami, M.; Ubukata, M.; Ito, Y. *Tetrahedron Lett.*, **1998**, *39*, 7361.

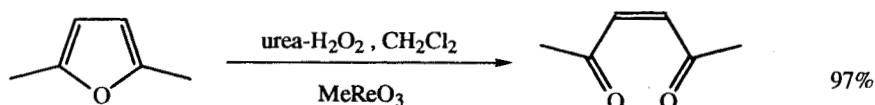


Majetich, G.; Fang, J. *Tetrahedron Lett.*, **1998**, *39*, 8381.

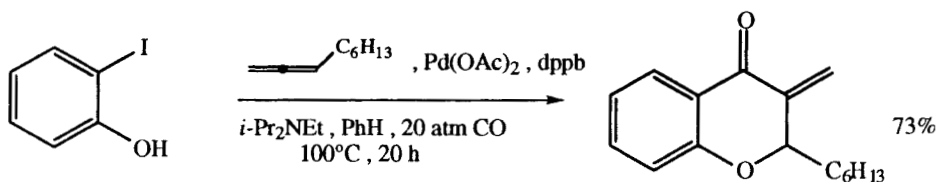


Hashmi, A.S.K.; Schwarz, L.; Bolte, M. *Tetrahedron Lett.*, **1998**, *39*, 8969.

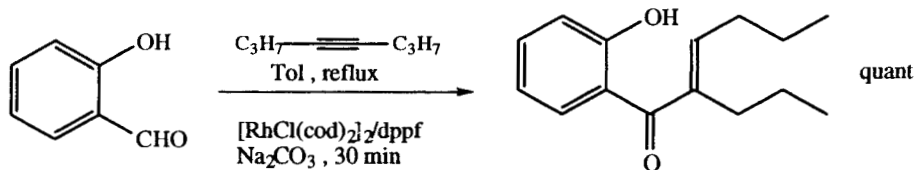




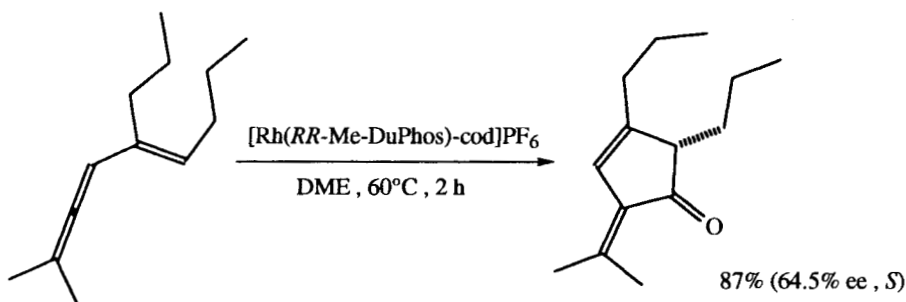
Finlay, J.; McKervey, M.A.; Gunaratne, H.Q.N. *Tetrahedron Lett.*, **1998**, 39, 5651.



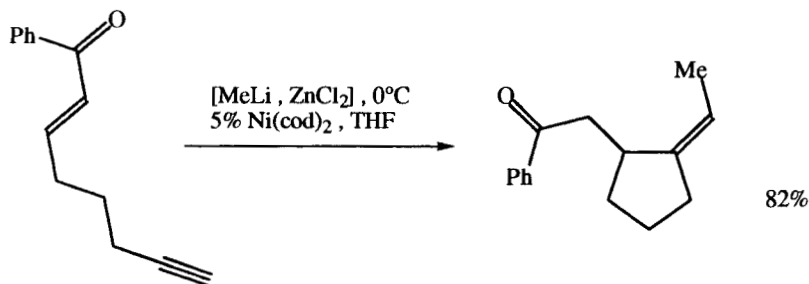
Okuro, K.; Alper, H. *J. Org. Chem.*, **1997**, 62, 1566.



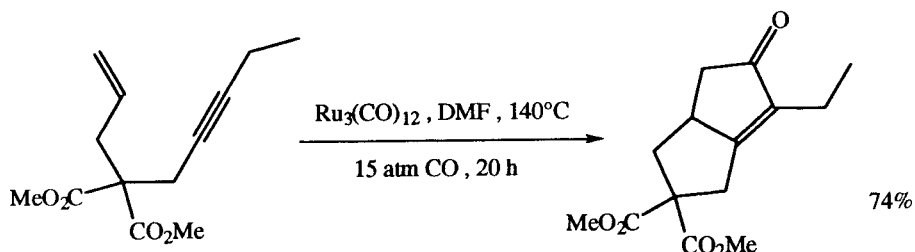
Kokubo, K.; Matsumasa, K.; Miura, M.; Nomura, M. *J. Org. Chem.*, **1997**, 62, 4564.



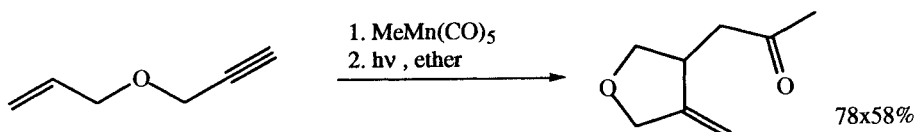
Murakami, M.; Itami, K.; Ito, Y. *J. Am. Chem. Soc.*, **1997**, 119, 2950.



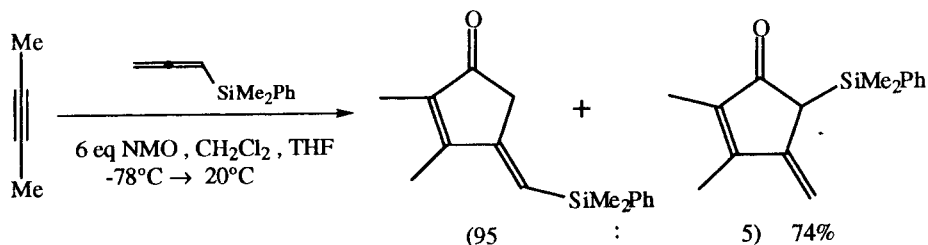
Montgomery, L.; Oblinger, E.; Savchenko, A.V. *J. Am. Chem. Soc.*, **1997**, 119, 4911.



Kondo, T.; Suzuki, N.; Okada, T.; Mitsudo, T. *J. Am. Chem. Soc.*, **1997**, 119, 6187.

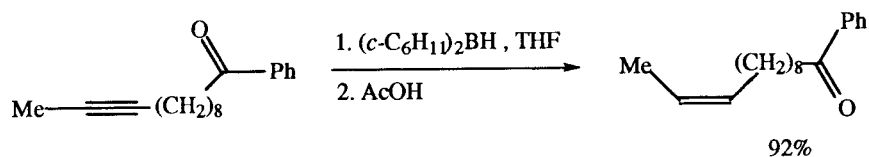


Lee, J.E.; Hong, S.H.; Chung, Y.K. *Tetrahedron Lett.*, **1997**, 38, 1781.

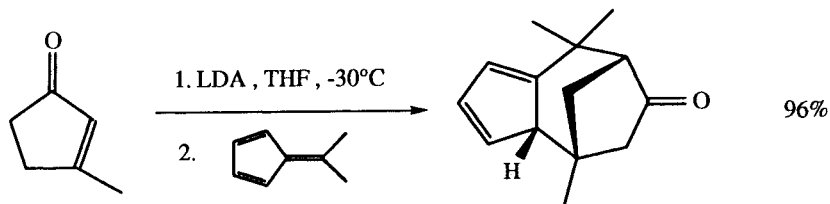


Ahmar, M.; Chabanis, O.; Gauthier, J.; Cazes, B. *Tetrahedron Lett.*, **1997**, 38, 5277.

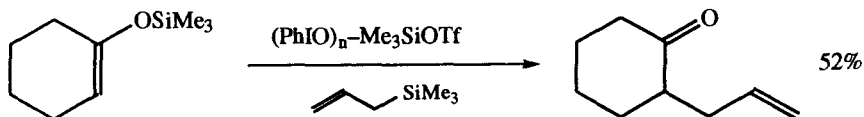
Ahmar, M.; Locatelli, C.; Colombier, D.; Cazes, B. *Tetrahedron Lett.*, **1997**, 38, 5281.



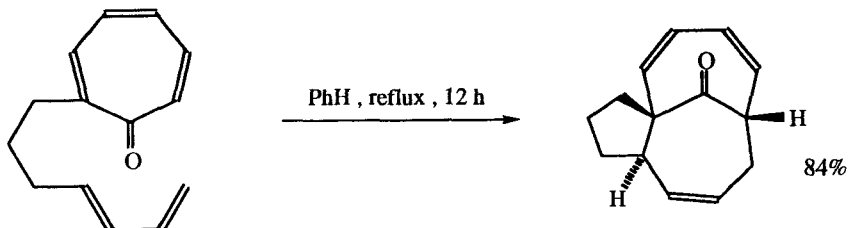
Kabalka, G.W.; Yu, S.; Li, N.-S. *Tetrahedron Lett.*, **1997**, 38, 7681.



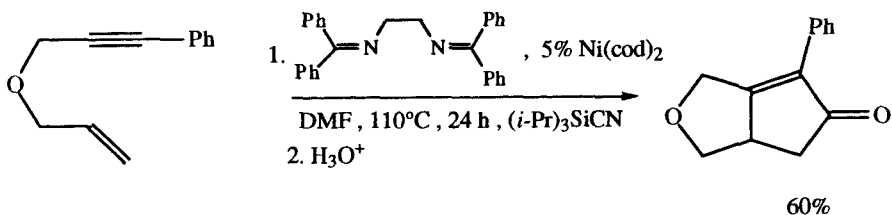
Hong, B.-C.; Hong, J.-H. *Tetrahedron Lett.*, **1997**, 38, 255.



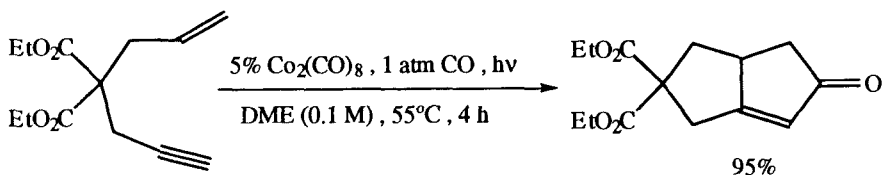
Moriarty, R.M.; Epa, W.R.; Prakash, O. *J. Chem. Res (S)*, **1997**, 262.



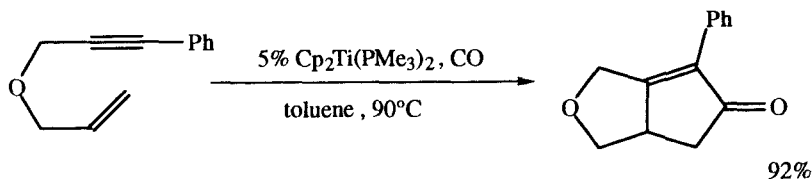
Rigby, J.H.; Rege, S.D.; Sandanayaka, V.P.; Kirova, M. *J. Org. Chem.*, **1996**, 61, 842.



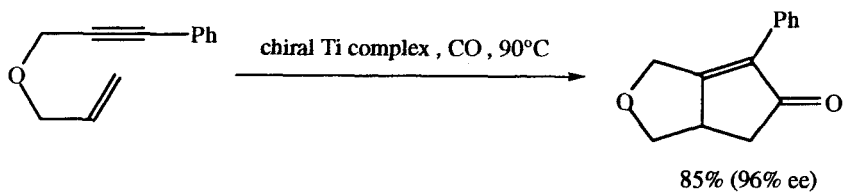
Zhang, M.; Buchwald, S.L. *J. Org. Chem.*, **1996**, 61, 4498.



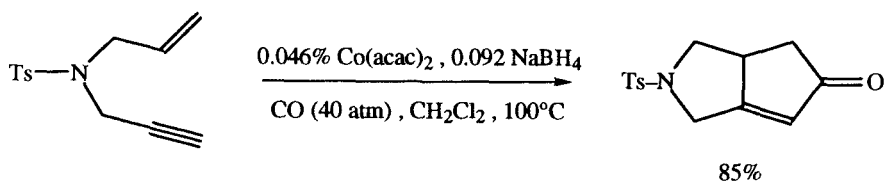
Pagenkopf, B.L.; Livinghouse, T. *J. Am. Chem. Soc.*, **1996**, 118, 2285.



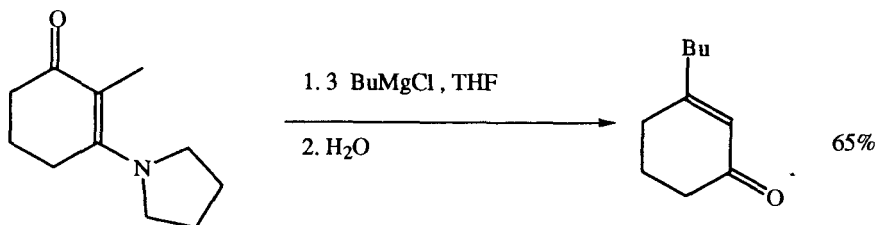
Hicks, F.A.; Kablaoui, N.M.; Buchwald, S.L. *J. Am. Chem. Soc.*, **1996**, 118, 9450.



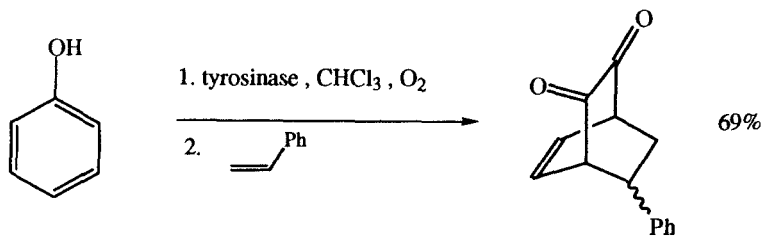
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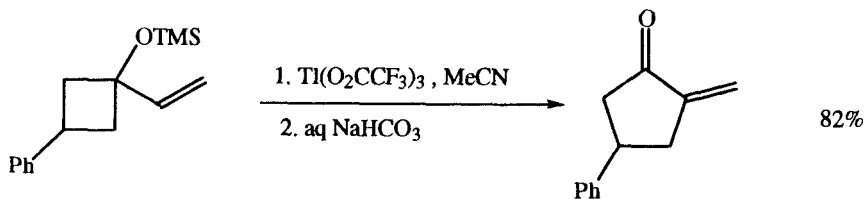
Lee, N.Y.; Chung, Y.K., *Tetrahedron Lett.*, **1996**, *37*, 3145.



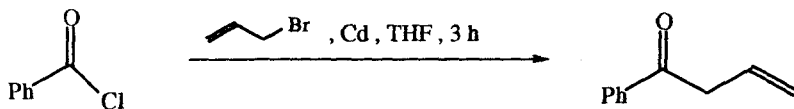
Shawe, T.T.; Landino, L.M.; Ross, A.A.; Prokopowicz, A.S.; Robinson, P.M.; Cannon, A. *Tetrahedron Lett.*, **1996**, *37*, 3823.



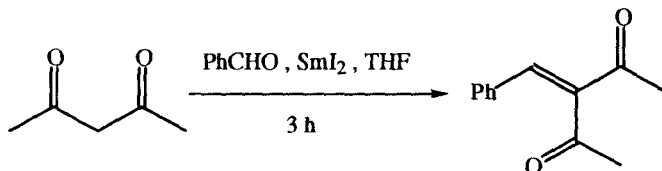
Müller, G.H.; Waldmann, H., *Tetrahedron Lett.*, **1996**, *37*, 3833.



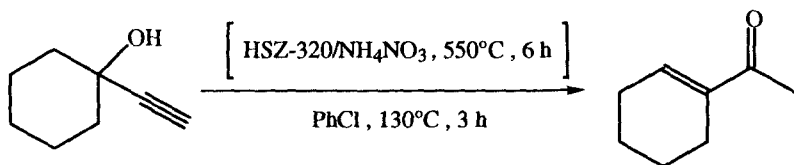
Kim, S.; Uh, K.H. *Tetrahedron Lett.*, **1996**, *37*, 3865.



90%

Baruah, B.; Boruah, A.; Prajapati, D.; Sandhu, J.S. *Tetrahedron Lett.*, **1996**, 37, 9087.

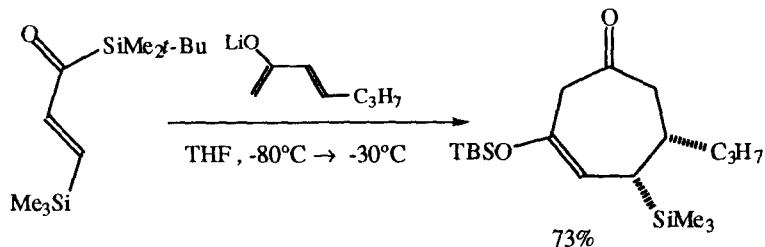
78%

Bao, W.; Zhang, Y.; Wang, J. *Synth. Commun.*, **1996**, 26, 3025.

quant

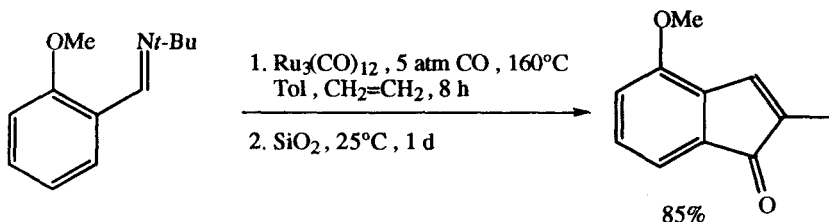
Sartori, G.; Pastorio, A.; Maggi, R.; Bigi, F. *Tetrahedron*, **1996**, 52, 8287.**SECTION 375: NITRILE - NITRILE**

NO ADDITIONAL EXAMPLES

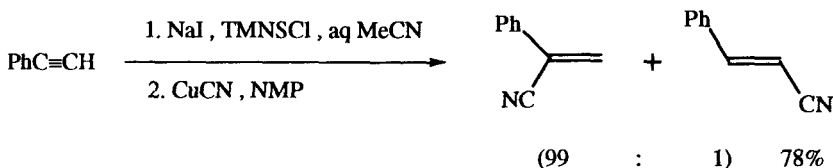
**SECTION 376: NITRILE - ALKENE**

73%

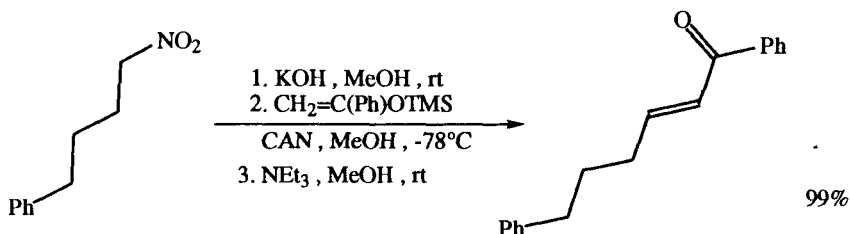
Takeda, K.; Nakajima, A.; Takeda, M.; Okamoto, Y.; Sato, T.; Yoshii, E.; Koizumi, T.; Shiro M. *J. Am. Chem. Soc.* **1998**, 120, 4947.



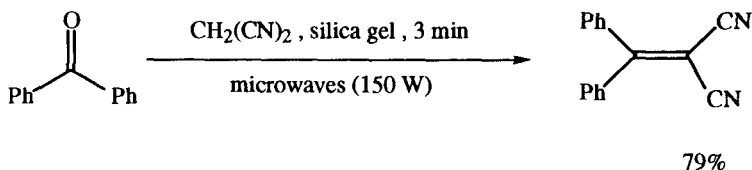
Fukuyama, T.; Chatani, N.; Kakiuchi, F.; Murai, S. *J. Org. Chem.*, **1997**, 62, 5647.



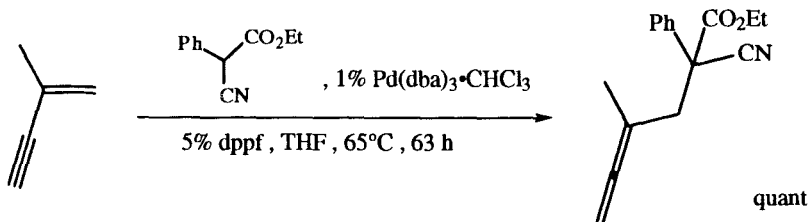
Luo, F.-T.; Ko, S.-L.; Chao, D.-Y. *Tetrahedron Lett.*, **1997**, 38, 8061.



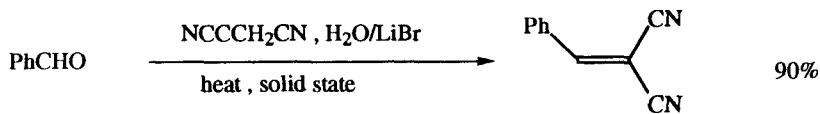
Arai, N.; Narasaka, K. *Bull. Chem. Soc. Jpn.*, **1997**, 70, 2525.



de la Cruz, P.; Díez-Barra, E.; Loupy, A.; Langa, F. *Tetrahedron Lett.*, **1996**, 37, 1113.

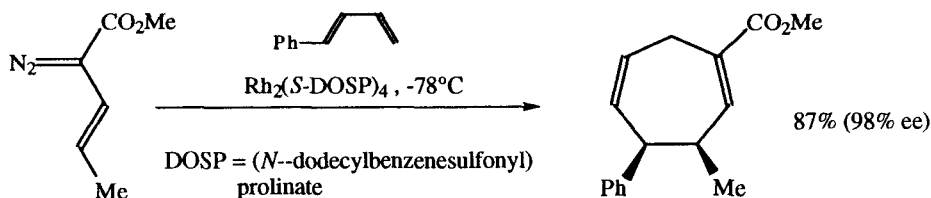


Salter, M.M.; Gevorgyan, V.; Saito, S.; Yamamoto, Y. *Chem. Commun.*, **1996**, 17.

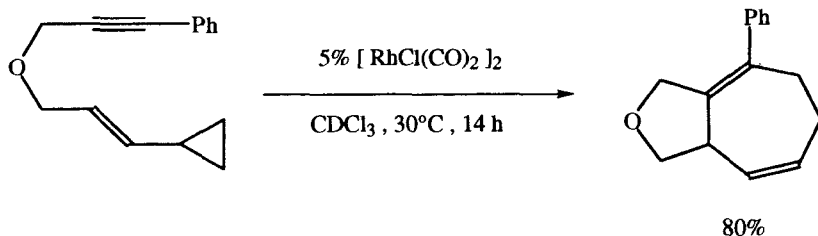


Prajapati, D.; Lekhok, K.C.; Sandhu, J.S.; Ghosh, A.C. *J. Chem. Soc., Perkin Trans. 1*, **1996** 959.

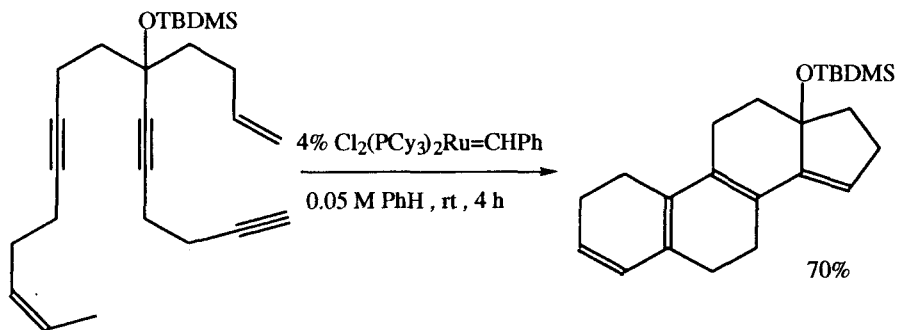
## SECTION 377: ALKENE - ALKENE



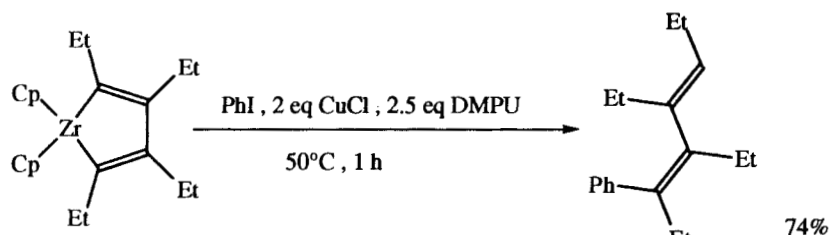
Davies, H.M.L.; Stafford, D.G.; Doan, B.D.; Houser, J.H. *J. Am. Chem. Soc.*, **1998**, *120*, 3326.



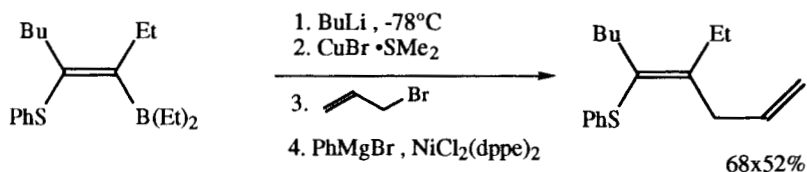
Wender, P.A.; Sperandio, D. *J. Org. Chem.*, **1998**, *63*, 4164.



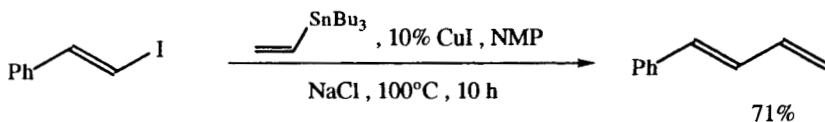
Zuercher, W.J.; Scholl, M.; Grubbs, R.H. *J. Org. Chem.*, **1998**, *63*, 4291.



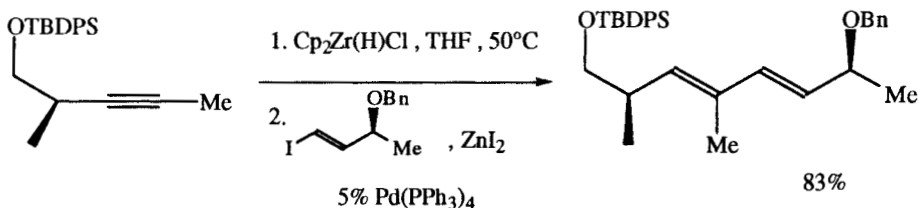
Takahashi, T.; Sun, W.-H.; Xi, C.; Ubayama, H.; Xi, Z. *Tetrahedron*, **1998**, *54*, 715.



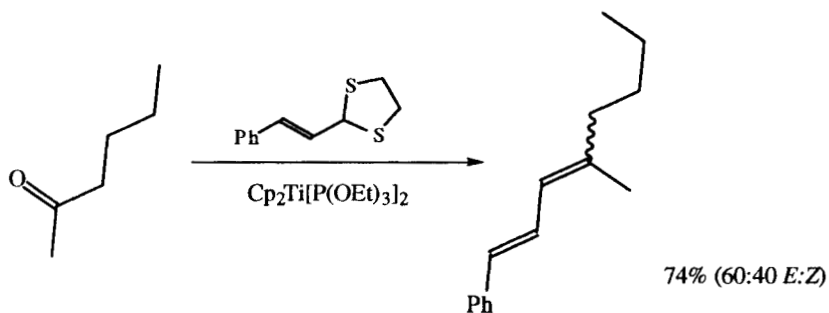
Gerard, J.; Bietlot, E.; Hevesi, L. *Tetrahedron Lett.*, **1998**, *39*, 8735.



Kang, S.-K.; Kim, J.-S.; Choi, S.-C. *J. Org. Chem.*, **1997**, *62*, 4208.

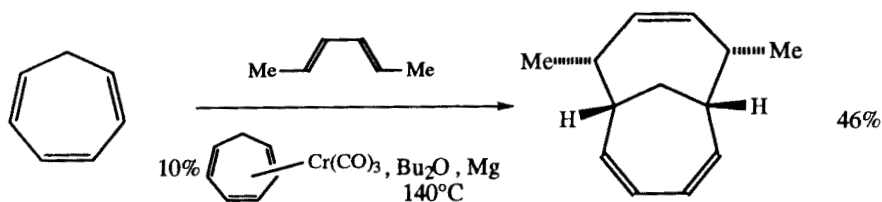


Panek, J.S.; Hu, T. *J. Org. Chem.*, **1997**, *62*, 4912.

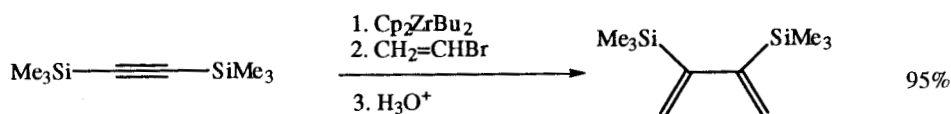


Horikawa, Y.; Watanabe, M.; Fujiwara, T.; Takeda, T. *J. Am. Chem. Soc.*, **1997**, *119*, 1127.

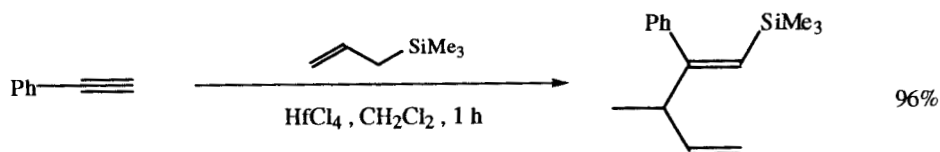




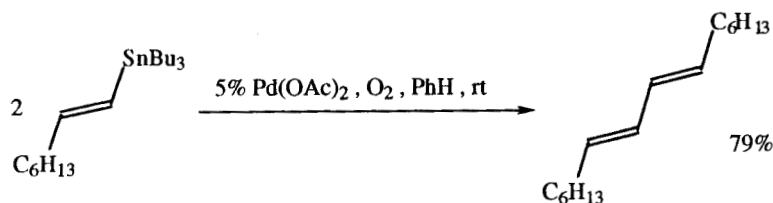
Rigby, J.H.; Fiedler, C. *J. Org. Chem.*, **1997**, 62, 6106.



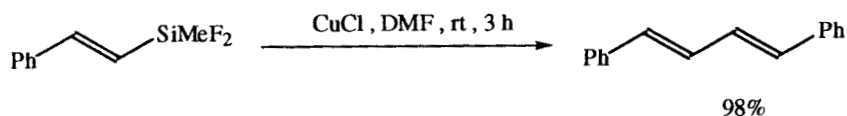
Takahashi, T.; Xi, Z.; Fischer, R.; Huo, S.; Xi, C.; Nakajima, K. *J. Am. Chem. Soc.*, **1997**, 119, 4561.



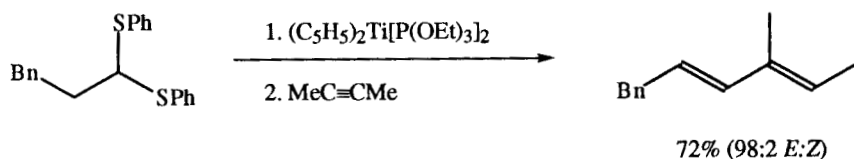
Yoshikawa, E.; Gevorgyan, V.; Asao, N.; Yamamoto, Y. *J. Am. Chem. Soc.*, **1997**, 119, 6781.



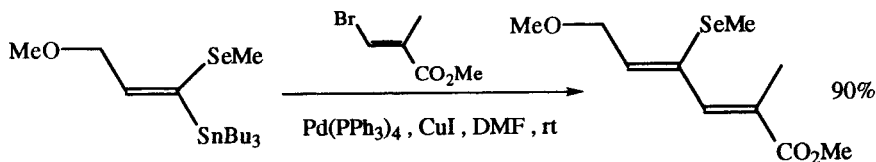
Alcaraz, L.; Taylor, R.J.K. *SynLett.*, **1997**, 791.



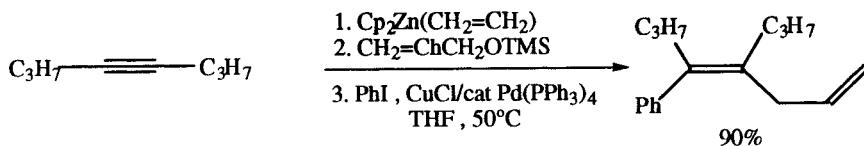
Ikegashira, K.; Nishihara, Y.; Hirabayashi, K.; Mori, A.; Hiyama, T. *Chem. Commun.*, **1997**, 1039.



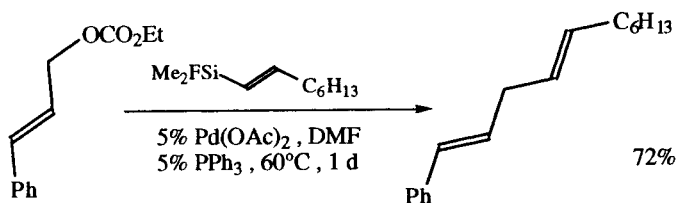
Takeda, T.; Shimokawa, H.; Miyachi, Y.; Fujiwara, T. *Chem. Commun.*, **1997**, 105.



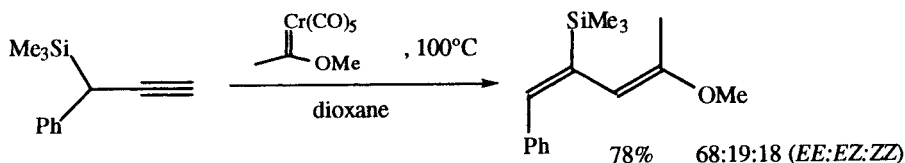
Ma, Y.; Huang, X. *J. Chem. Soc., Perkin Trans., I*, **1997**, 2953.



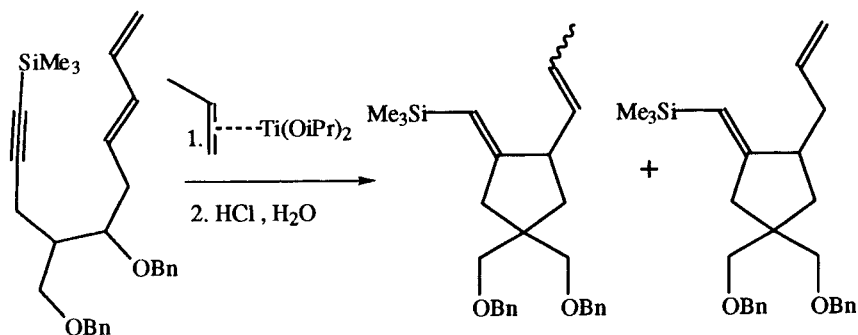
Hara, R.; Nishihara, Y.; Landré, P.D.; Takahashi, T. *Tetrahedron Lett.*, **1997**, 38, 447.



Matsubashi, H.; Asai, S.; Hirabayashi, K.; Hatanaka, Y.; Mori, A.; Hiyama, T. *Bull. Chem. Soc. Jpn.*, **1997**, 70, 1943.

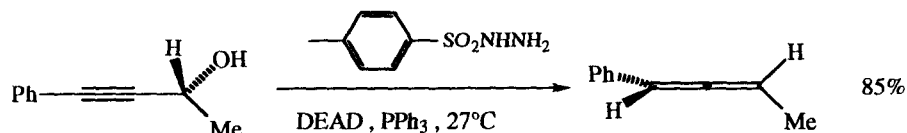


Herndon, J.W.; Patel, P.P. *J. Org. Chem.*, **1996**, 61, 4500.

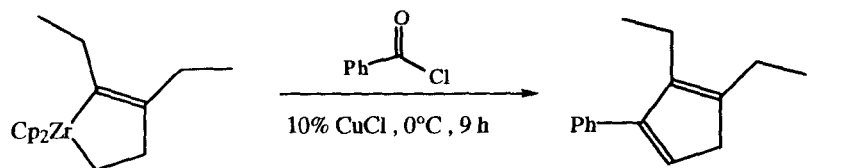


(8) : 2) quant.

Urabe, H.; Takeda, T.; Sato, F. *Tetrahedron Lett.*, **1996**, 37, 1253.



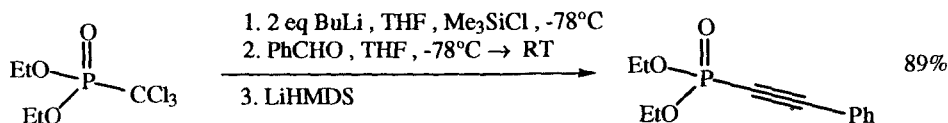
Myers, A.G.; Zheng, B. *J. Am. Chem. Soc.*, **1996**, *118*, 4492.



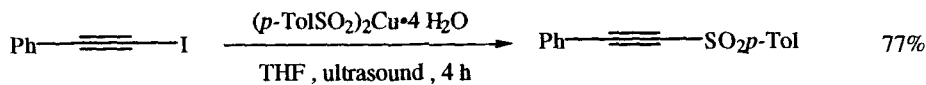
51% (20:10:1 positional isomers)

Takahashi, T.; Xi, Z.; Kitora, M.; Xi, C.; Nakajima, K. *Tetrahedron Lett.*, **1996**, *37*, 7521.

## SECTION 378: OXIDES - ALKYNES



Dizière, R.; Savignac, P. *Tetrahedron Lett.*, **1996**, *36*, 1783.

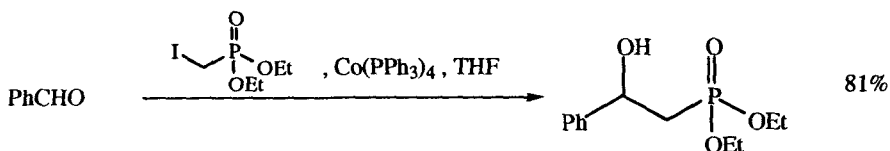


Suzuki, H.; Abe, H. *Tetrahedron Lett.*, **1996**, *37*, 3717.

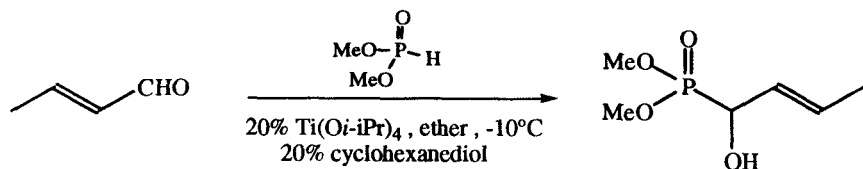
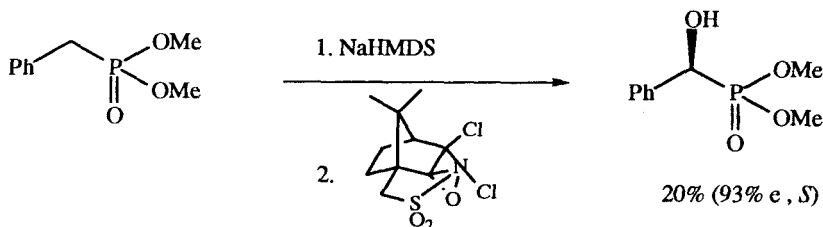
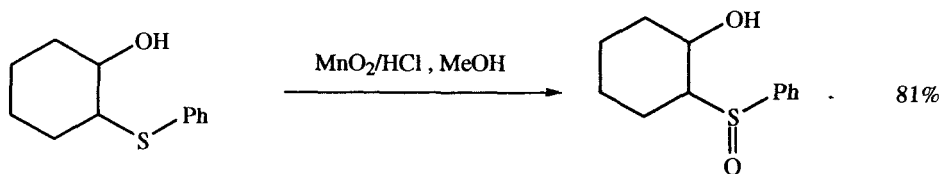
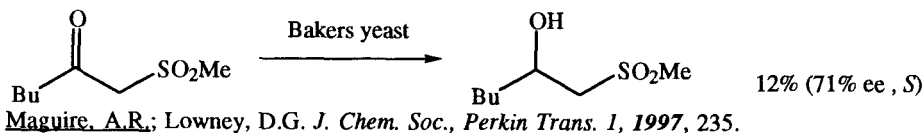
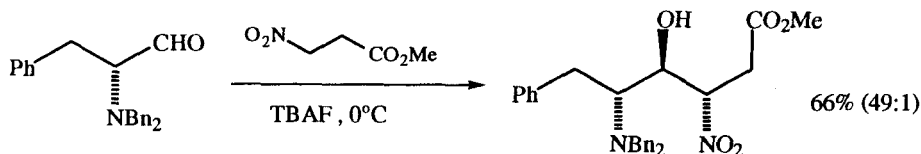
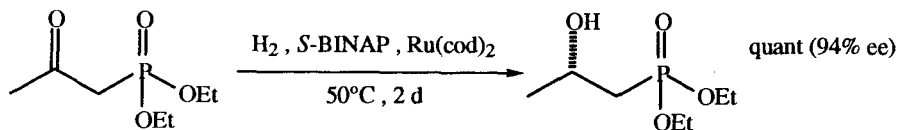
## SECTION 379: OXIDES - ACID DERIVATIVES

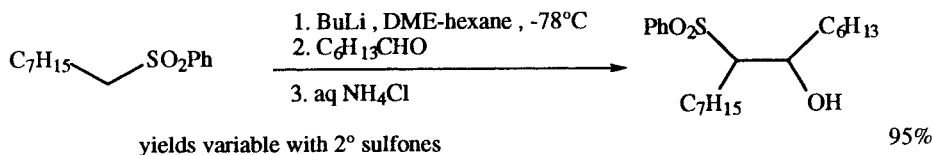
NO ADDITIONAL EXAMPLES

## SECTION 380: OXIDES - ALCOHOLS, THIOLS



Orsini, F. *Tetrahedron Lett.*, **1998**, *39*, 1425.

72% (65% ee, *R*)Groaning, M.D.; Rowe, B.J.; Spilling, C.D. *Tetrahedron Lett.*, **1998**, 39, 5485.20% (93% e, *S*)Pogatchnik, D.M.; Wiemer, D.E. *Tetrahedron Lett.*, **1997**, 38, 3495.Gabbi, C.; Ghelfi, F.; Grandi, R. *Synth. Commun.*, **1997**, 27, 2857.Maguire, A.R.; Lowney, D.G. *J. Chem. Soc., Perkin Trans. 1*, **1997**, 235.Hanessian, S.; Devasthale, P.V. *Tetrahedron Lett.*, **1996**, 37, 987.Gautier, I.; Ratovelomanana-Vidal, V.; Savignac, P.; Genêt, J.-P. *Tetrahedron Lett.*, **1996**, 37, 7721.

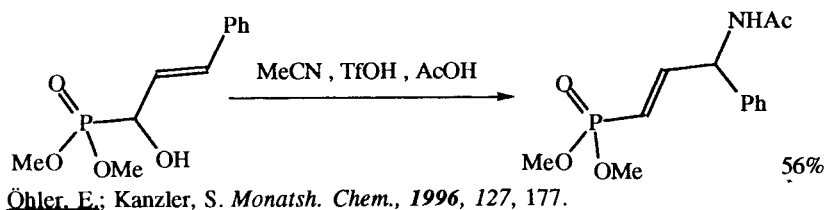


Hart, D.J.; Wu, W.-L. *Tetrahedron Lett.*, **1996**, 37, 5283.

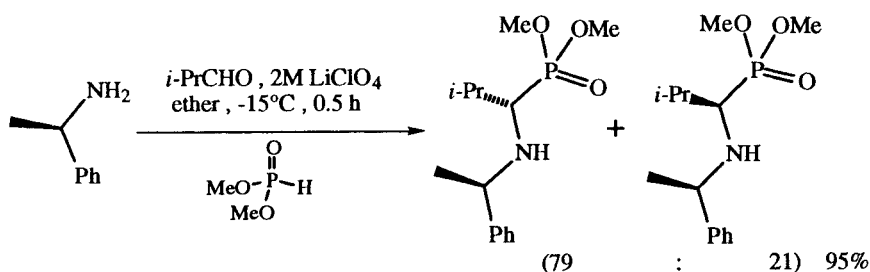
## SECTION 381      OXIDES - ALDEHYDES

NO ADDITIONAL EXAMPLES

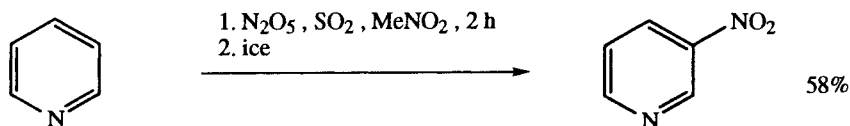
## SECTION 382:      OXIDES - AMIDES



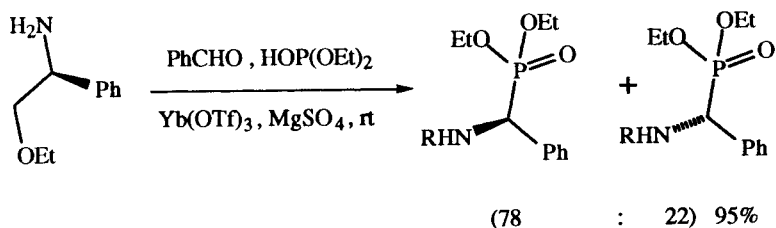
## SECTION 383:      OXIDES - AMINES



Heydari, A.; Karimian, A.; Ipaktschi, J. *Tetrahedron Lett.*, **1998**, 39, 6729.

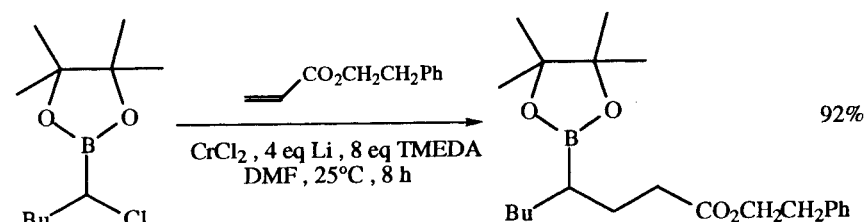


Armnestad, B.; Bakke, J.M.; Hegbom, I.; Ranes, E. *Acta Chem. Scand. B*, **1996**, 50, 556.

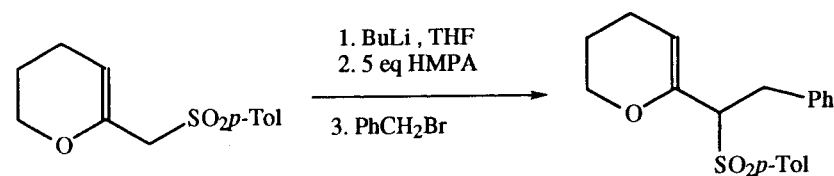


Qian, C.; Huang, T. *J. Org. Chem.*, **1998**, 63, 4125.

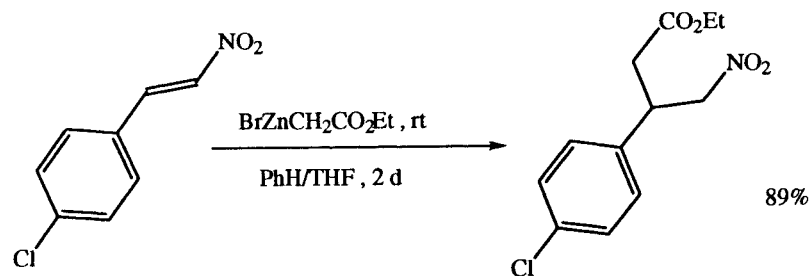
## SECTION 384: OXIDES - ESTERS



Takai, K.; Shinomiya, N.; Ohta, M. *SynLett.*, **1998**, 253.

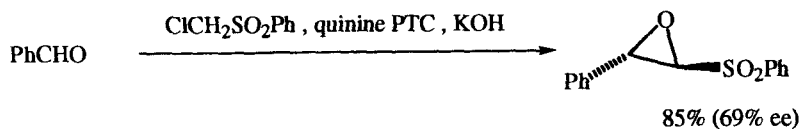


Edwards, G.L.; Sinclair, D.J.; Wasiowych, C.D. *SynLett.*, **1997**, 1285.

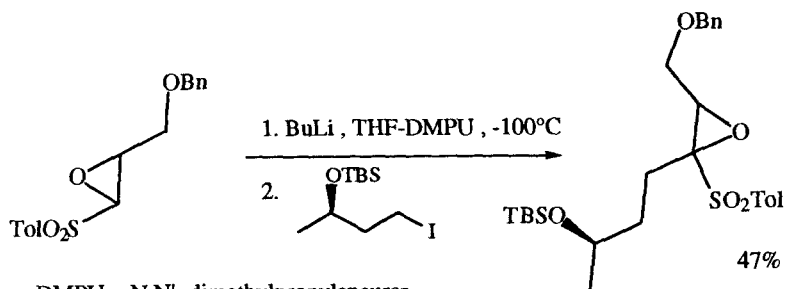


Menicagli, R.; Samritani, S. *Tetrahedron*, **1996**, 52, 1425.

## SECTION 385: OXIDES - ETHERS, EPOXIDES, THIOETHERS



Arai, S.; Ishida, T.; Shioiri, T. *Tetrahedron Lett.*, **1998**, 39, 8299.



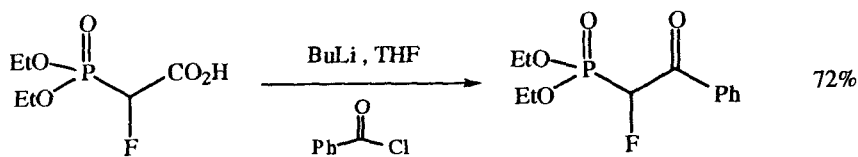
DMPU = N,N'-dimethylpropyleneurea

Mori, Y.; Yaegashi, K.; Iwase, K.; Yamamori, Y.; Furukawa, H.  
*Tetrahedron Lett.*, **1996**, 37, 2605.

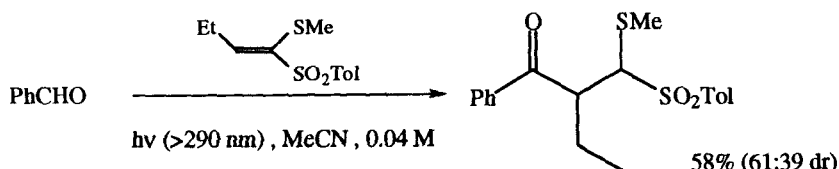
## SECTION 386: OXIDES - HALIDES, SULFONATES

NO ADDITIONAL EXAMPLES

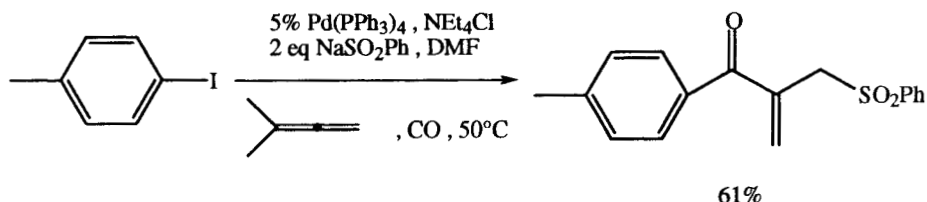
## SECTION 387: OXIDES - KETONES



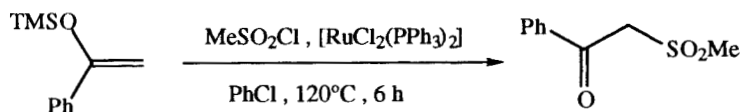
Kim, D.Y.; Choi, Y.J. *Synth. Commun.*, **1998**, 28, 1481.



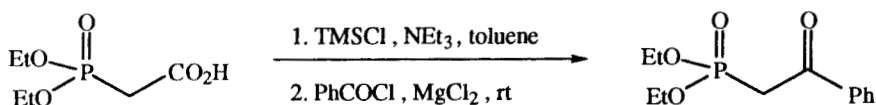
Ogura, K.; Arai, T.; Kayano, A.; Akazume, M. *Tetrahedron Lett.*, **1998**, 39, 9051.



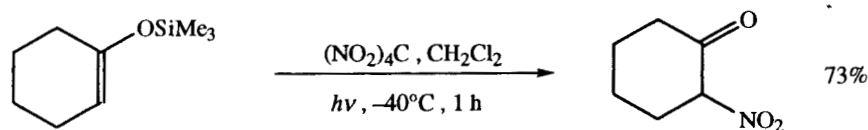
Grigg, R.; Brown, S.; Sridharan, V.; Uttley, M.D. *Tetrahedron Lett.*, **1997**, 38, 5031.



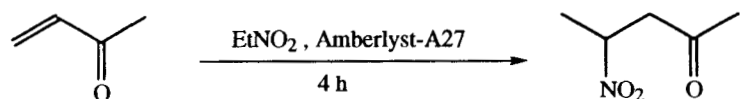
Kamigata, N.; Udodaira, K.; Shimizu, T. *J. Chem. Soc., Perkin Trans. 1*, **1997**, 783.



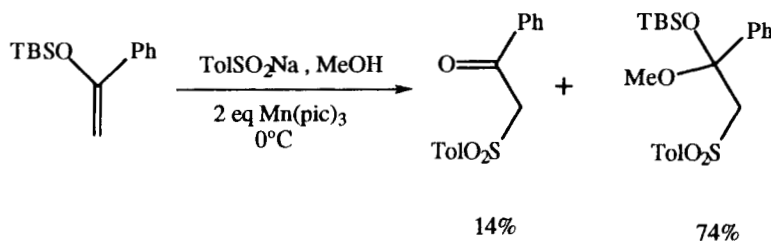
Kim, D.Y.; Kong, M.S.; Lee, K. *J. Chem. Soc., Perkin Trans. 1*, **1997**, 1361.



Rathore, R.; Kochi, J.K. *J. Org. Chem.*, **1996**, 61, 627.

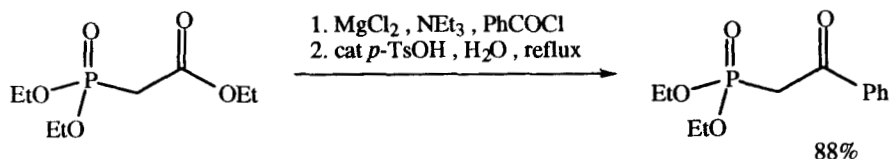


Ballini, R.; Marziali, P.; Mozzicafreddo, A. *J. Org. Chem.*, **1996**, 61, 3209.



Mochizuki, T.; Hayakawa, S.; Narasaka, K. *Bull. Chem. Soc. Jpn.*, **1996**, 69, 2317.



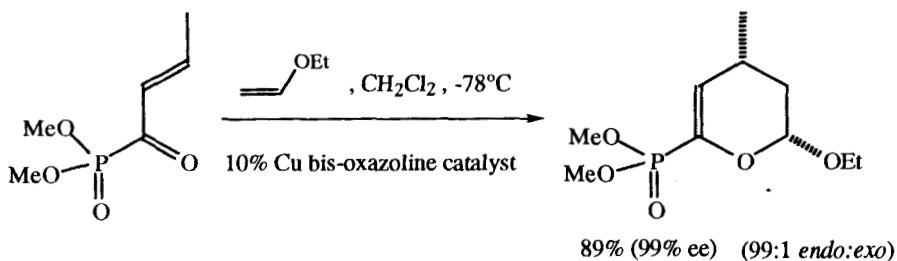


Kim, D.Y.; Kong, M.S.; Kim, T.H. *Synth. Commun.*, **1996**, 26, 2487.

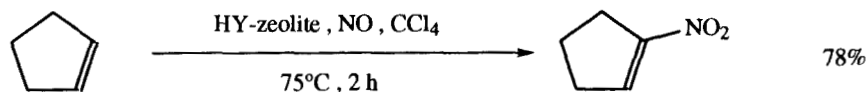
## SECTION 388: OXIDES - NITRILES

NO ADDITIONAL EXAMPLES

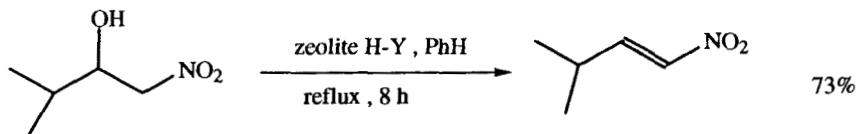
## SECTION 389: OXIDES - ALKENES



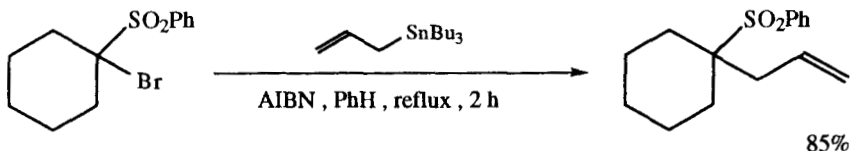
Evans, D.A.; Johnson, J.S. *J. Am. Chem. Soc.*, **1998**, 120, 4895.



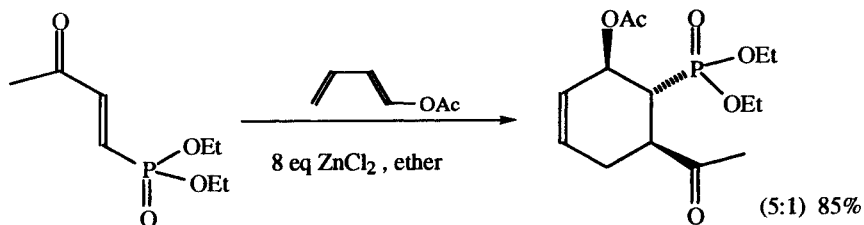
Sreekumar, R.; Padmakumar, R.; Rugmini, P. *Tetrahedron Lett.*, **1998**, 39, 2695.



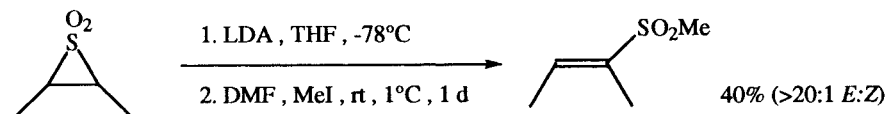
Anbazzhagan, M.; Kumaran, G.; Sasidharan, M. *J. Chem. Res. (S)*, **1997**, 336.



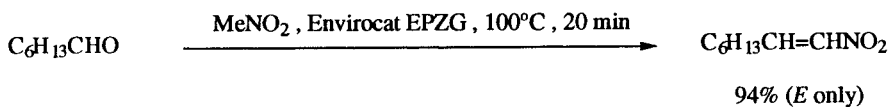
Giardinà, A.; Giovannini, R.; Petrini, M. *Tetrahedron Lett.*, **1997**, 38, 1995.



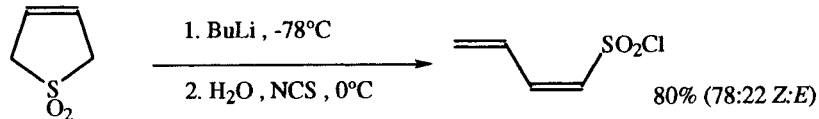
McClure, C.K.; Herzog, K.J.; Bruch, M.D. *Tetrahedron Lett.*, **1996**, 37, 2153.



Dishington, A.P.; Muccioli, A.B.; Simpkins, N.S. *SynLett.*, **1996**, 27.



Bandgar, B.P.; Zirange, M.B.; Wadgaonkar, P.P. *SynLett.*, **1996**, 149.



Lee, Y.S.; Ryu, E.K.; Yun, K.-Y.; Kim, Y.H. *SynLett.*, **1996**, 247.

## SECTION 390: OXIDES - OXIDES

NO ADDITIONAL EXAMPLES

- Abdelaziz, S. 283  
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 Angeles, E. 192  
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 Anson, M.S. 076  
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 Antonelli, E. 010  
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		Bansal, P.	171
		Bao, W.	301, 313, 327,
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**MICHAEL B. SMITH, PhD**, is Professor of Chemistry in the Department of Chemistry at the University of Connecticut at Storrs. His research interests focus on developing asymmetric reactions based on manipulating chiral, nonracemic lactams. This work is applied to the development of new synthetic methods and the synthesis of polycyclic alkaloids with anti-tumor or antiviral activity. Dr. Smith was responsible for developing a new reagent for determining the enantiomeric composition of alcohols and amines bearing a chiral center.

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