Total Synthesis of (±)-Jujuyane

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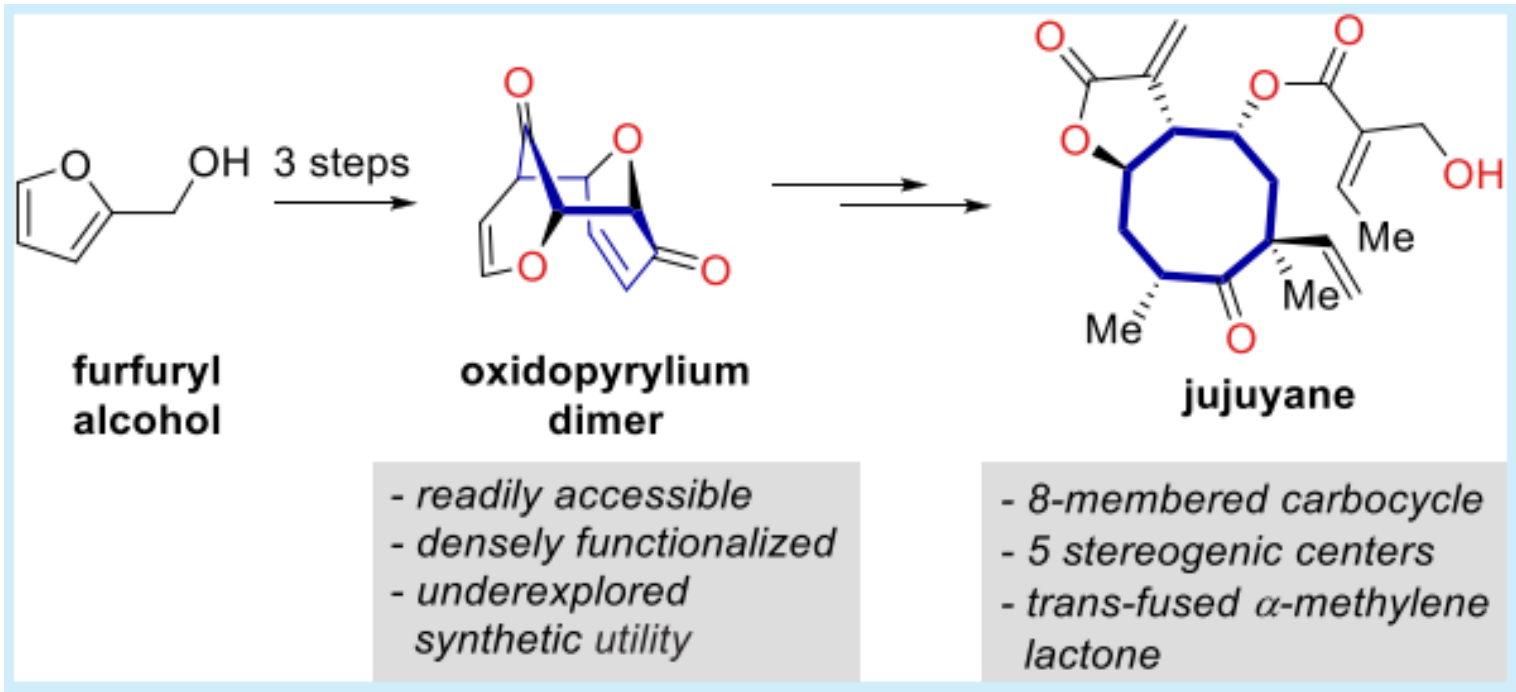

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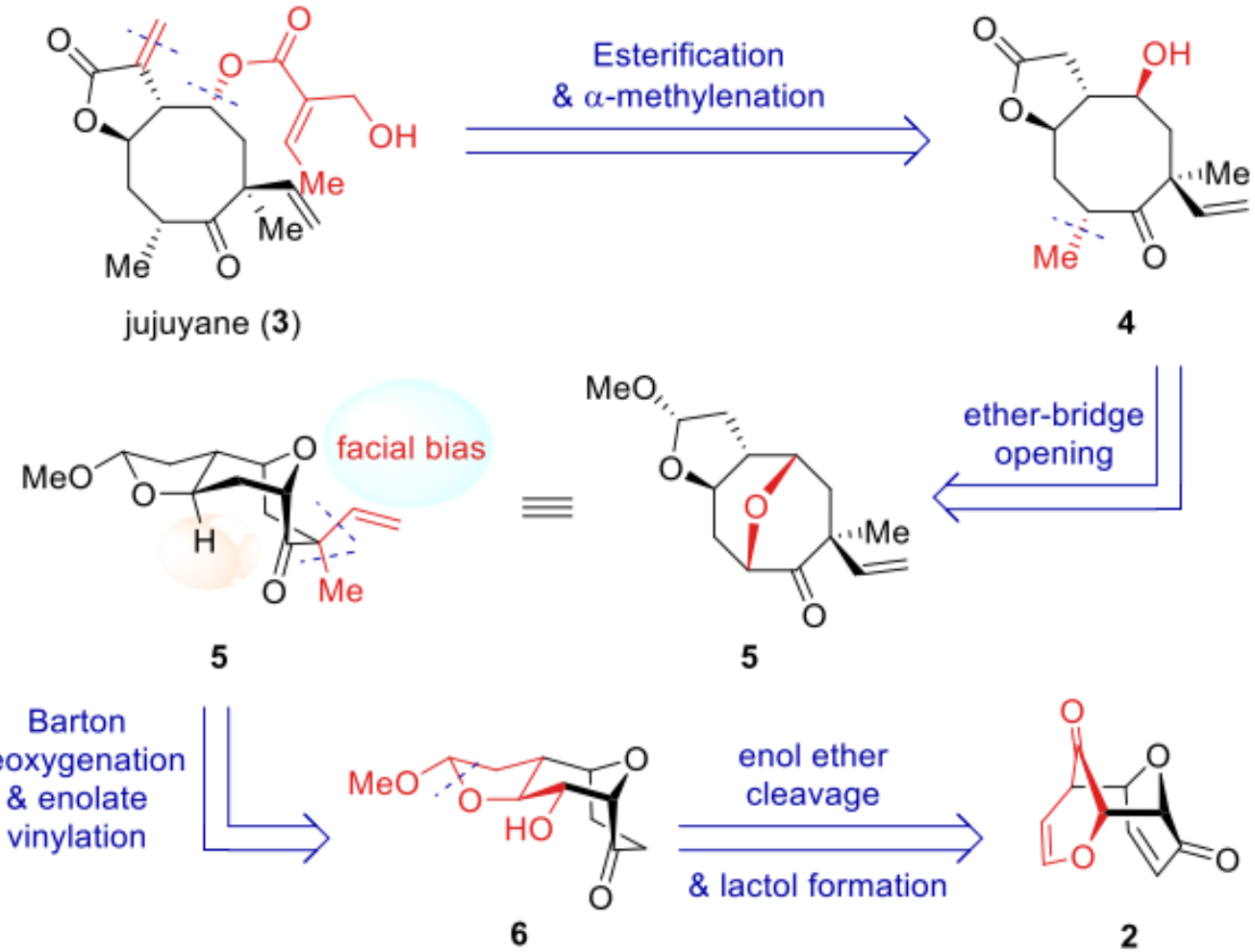
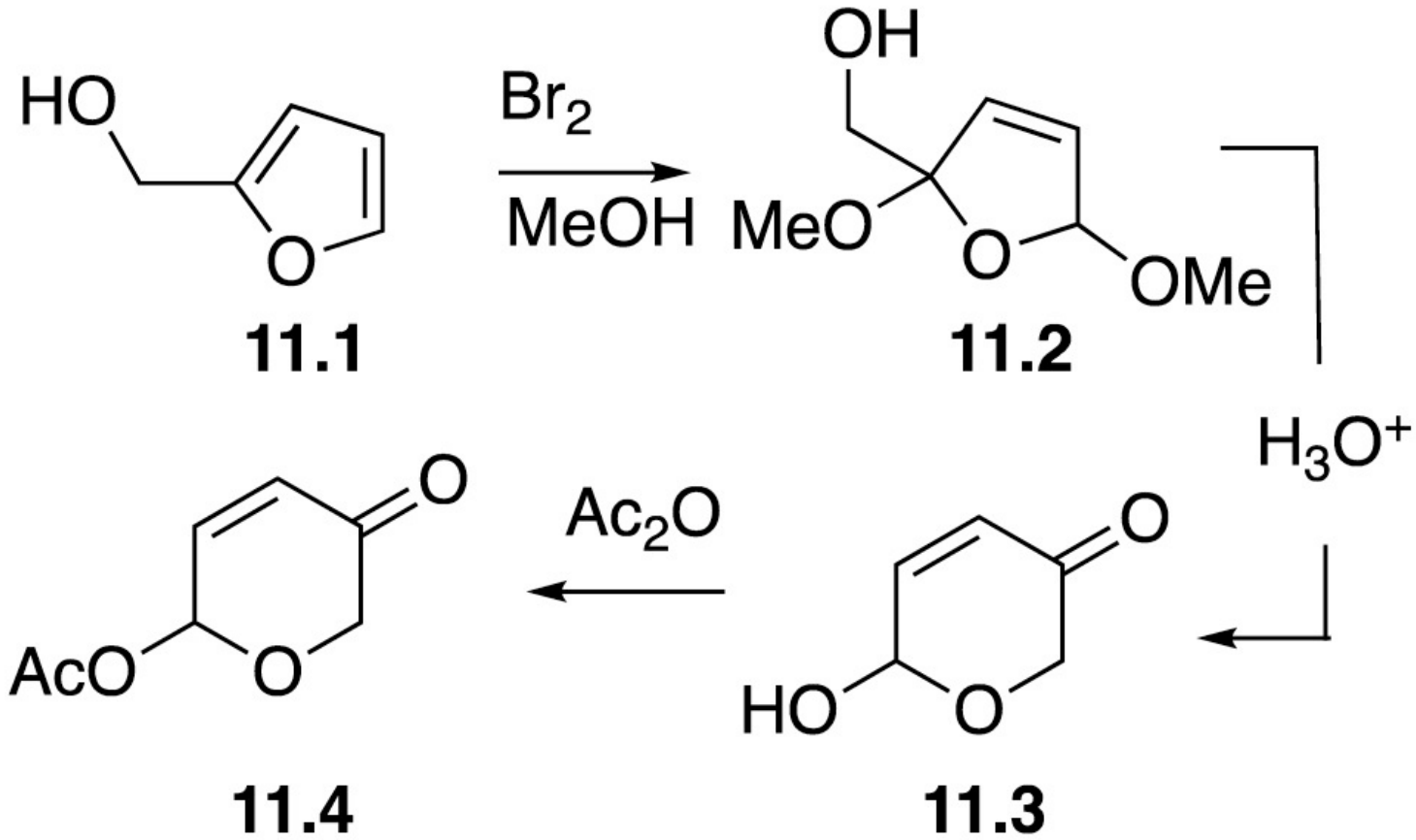
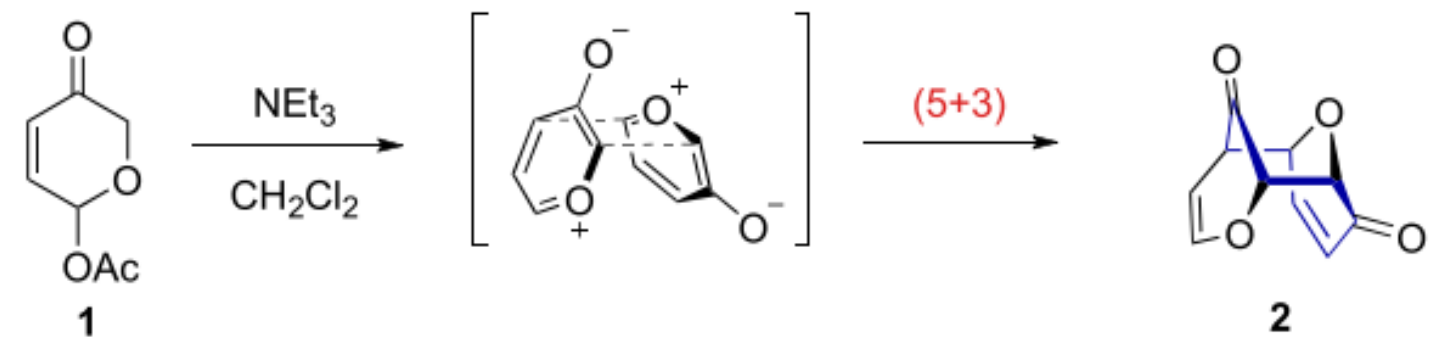
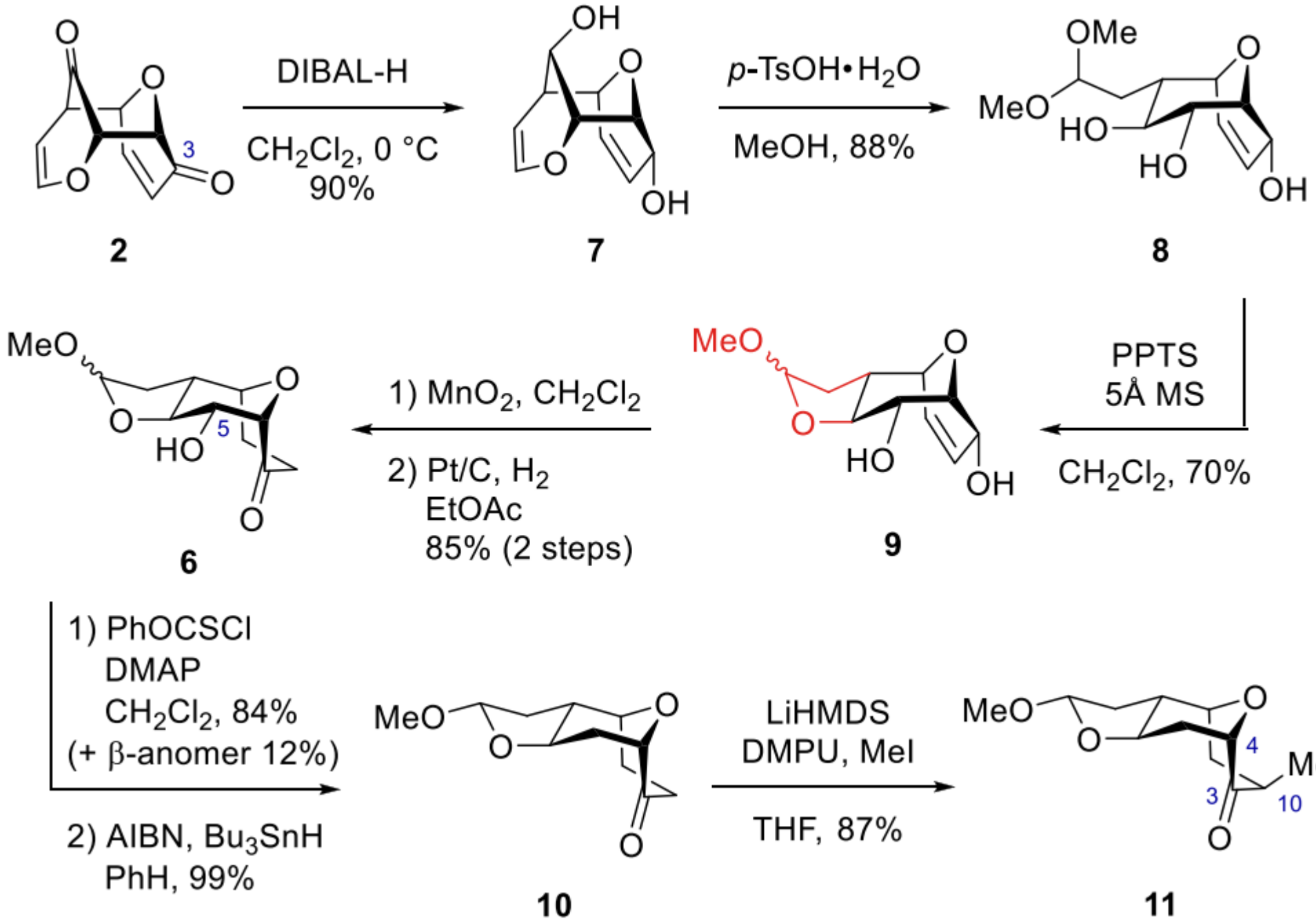
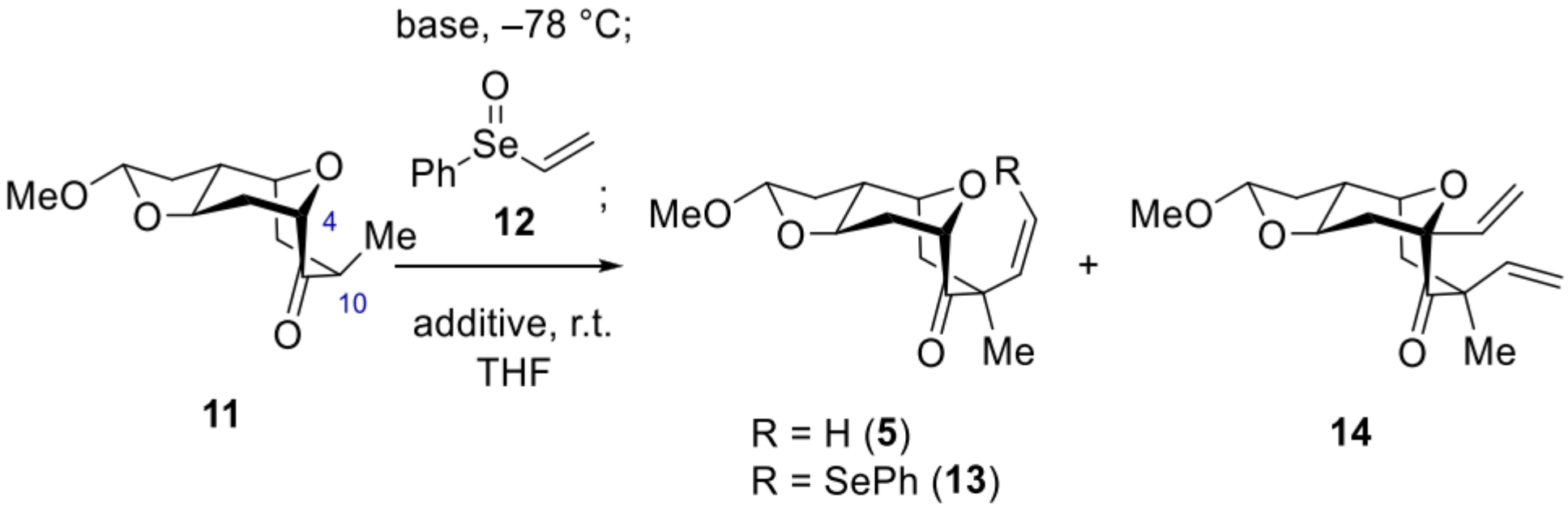
Scheme 1. Retrosynthetic Analysis of Jujuyane (3) from Oxidopyrylium Dimer (2)



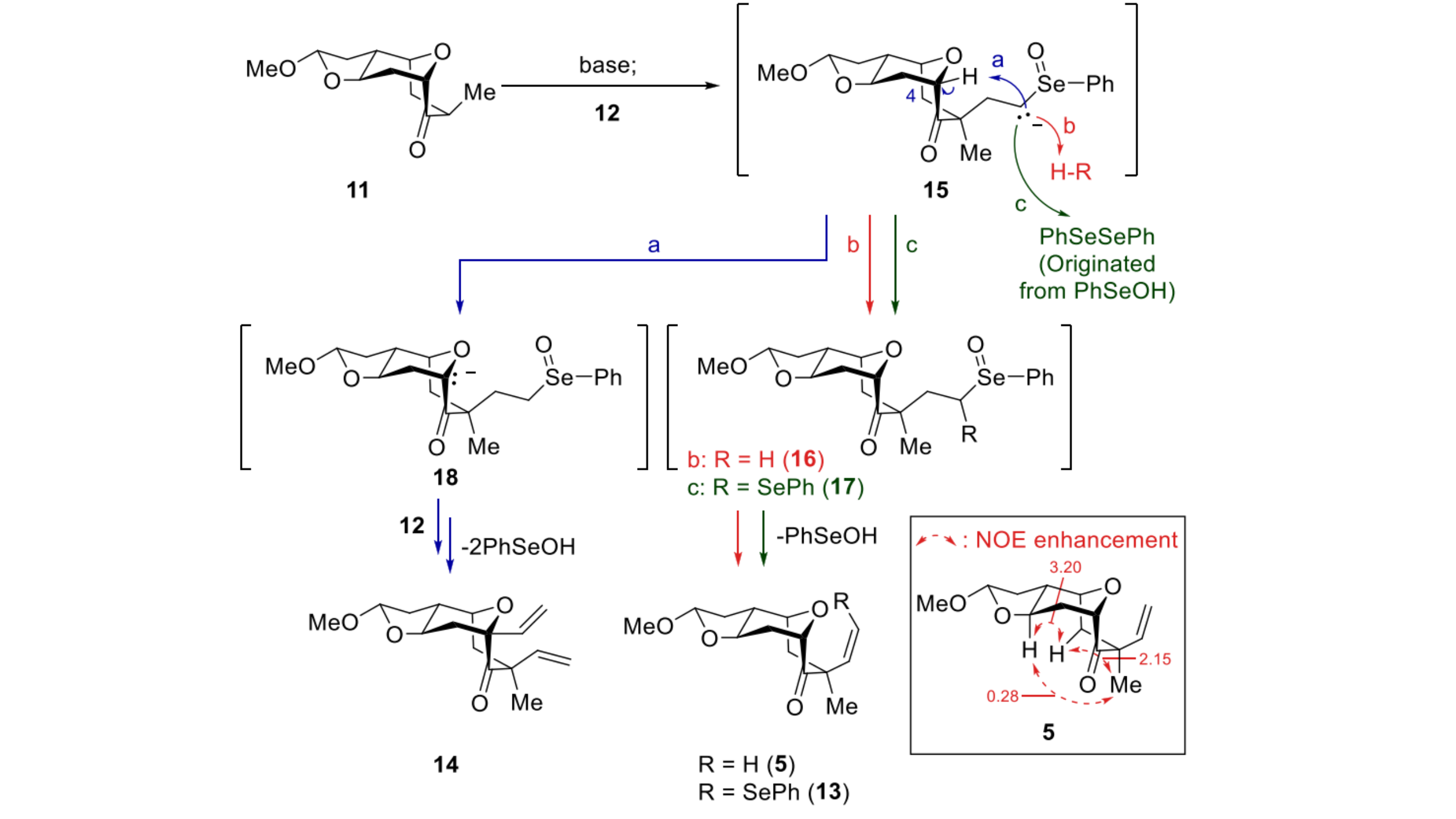

HO
O
Br2
MeOH
OH
MeO
O
OMe
11.1
11.2
H3O+
O
HO
O
Ac2O
O
AcO
O
11.3
11.4

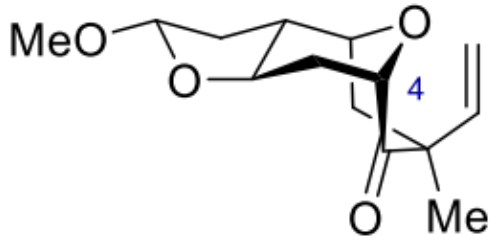

O
O
OAc
1
NEt3
CH2Cl2
O−
O+
O+
O−
(5+3)
O
O
O
O
2


DIBAL-H
CH2Cl2, 0 °C
90%
p-TsOH•H2O
MeOH, 88%
PPTS
5Å MS
CH2Cl2, 70%
1) MnO2, CH2Cl2
2) Pt/C, H2
EtOAc
85% (2 steps)
1) PhOCSCl
DMAP
CH2Cl2, 84%
(+ β-anomer 12%)
2) AIBN, Bu3SnH
PhH, 99%
LiHMDS
DMPU, MeI
THF, 87%
2
7
8
9
6
10
11



entry	base (equiv)	additive	yield (%) 5	13	14
1	LiHMDS (1.05)		59	20	11
2	NaHMDS (1.05)	H_2O	38		trace
3	NaHMDS (1.05)	Me_2NH			50
4	NaHMDS (0.5)	Me_2NH	59		40
5	NaHMDS (0.2)	Me_2NH	96		

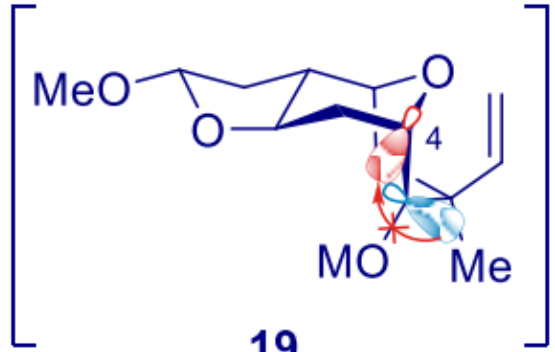

MeO
O
Me
O
11
base;
12
MeO
O
H
a
Se–Ph
4
b
H-R
O
Me
15
c
PhSeSePh
(Originated
from PhSeOH)
a
b
c
MeO
O
Se–Ph
O
Me
18
MeO
O
Se–Ph
R
O
Me
b: R = H (16)
c: R = SePh (17)
12
-2PhSeOH
-PhSeOH
MeO
O
O
Me
14
MeO
O
R
O
Me
R = H (5)
R = SePh (13)
: NOE enhancement
3.20
MeO
O
H
H
2.15
0.28
O
Me
5



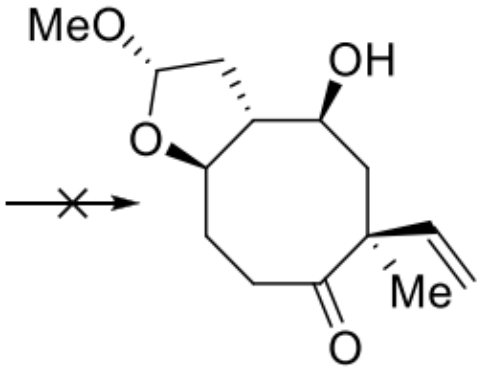
5

SmI_2, MeOH

HMPA/THF



19

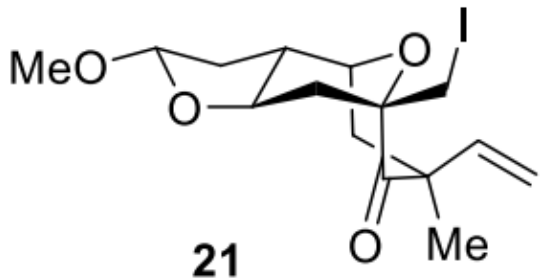


Not observed

LDA, CH_2I_2/THF

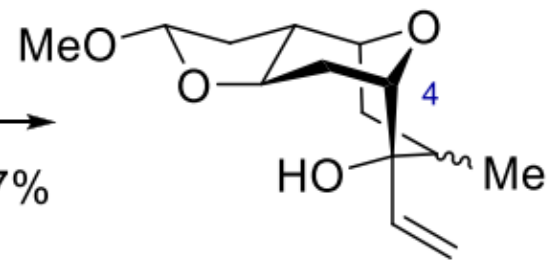
–40 °C to 0 °C

74%



21

57%



20

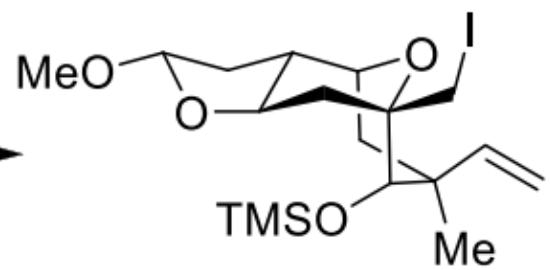
1) LAH, THF

–78 °C, 81%

2) TMSCl, Et_3N

TMS-imidazole

CH_2Cl_2, 91%

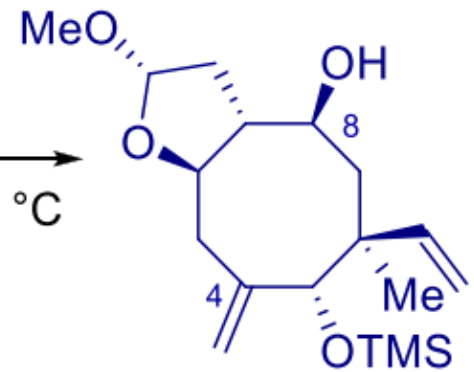


22

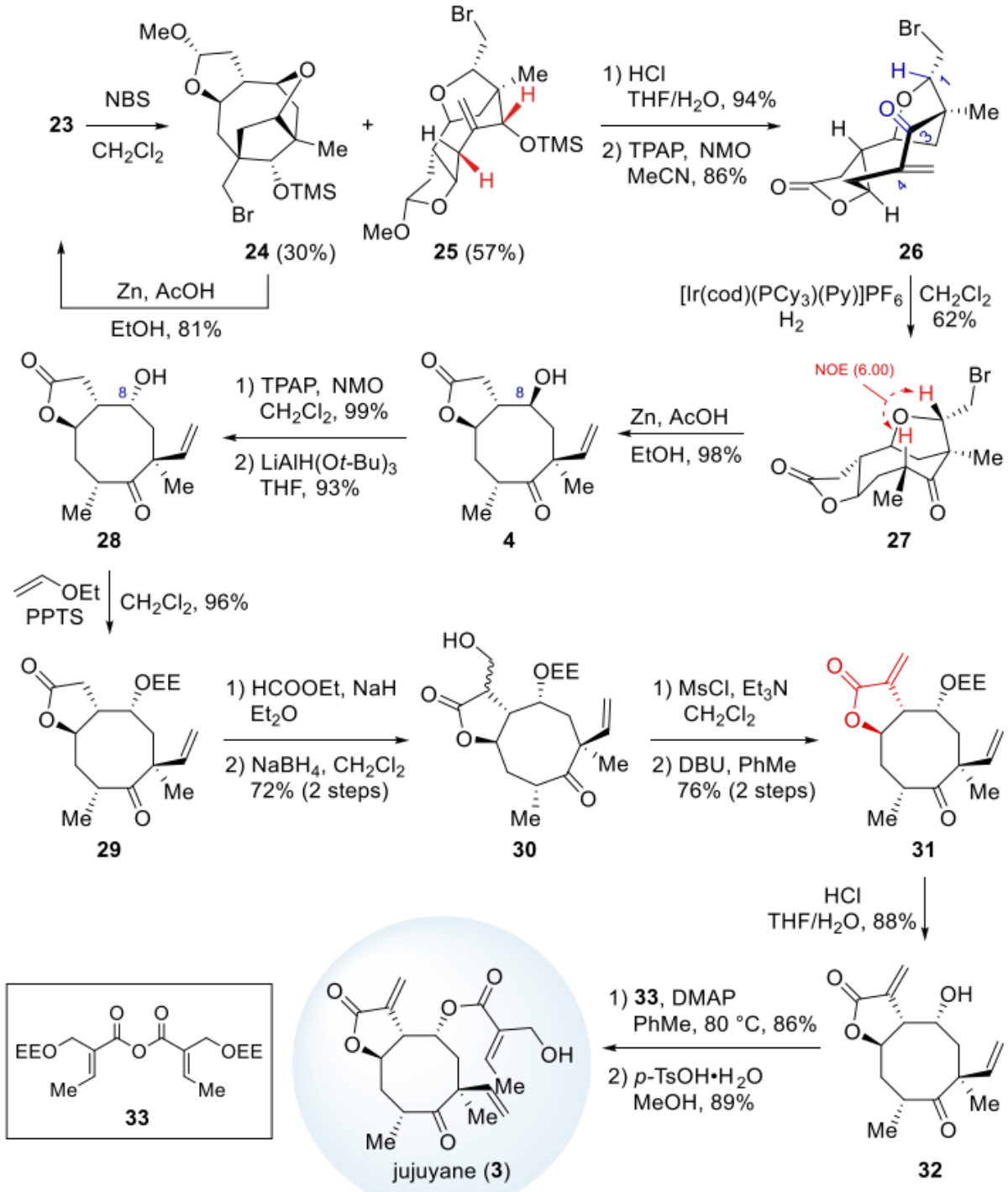
t-BuLi

Et_2O, –78 °C

99%



23


23
NBS
CH_2Cl_2
24 (30%)
25 (57%)
1) HCl
THF/H_2O, 94%
2) TPAP, NMO
MeCN, 86%
26
Zn, AcOH
EtOH, 81%
[Ir(cod)(PCy$_3$)(Py)]PF$_6$
H_2
CH_2Cl_2
62%
NOE (6.00)
27
Zn, AcOH
EtOH, 98%
4
1) TPAP, NMO
CH_2Cl_2, 99%
2) LiAlH(Ot-Bu)$_3$
THF, 93%
28
OEt
PPTS
CH_2Cl_2, 96%
29
1) HCOOEt, NaH
Et_2O
2) $NaBH_4$, CH_2Cl_2
72% (2 steps)
30
1) MsCl, Et_3N
CH_2Cl_2
2) DBU, PhMe
76% (2 steps)
31
HCl
THF/H_2O, 88%
32
1) 33, DMAP
PhMe, 80 °C, 86%
2) p-TsOH•H_2O
MeOH, 89%
33
jujuyane (3)

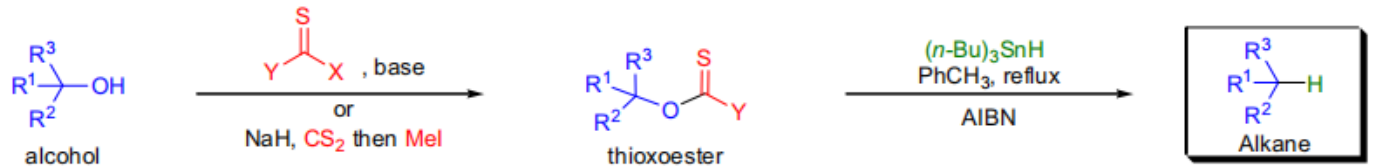
BARTON-McCOMBIE RADICAL DEOXYGENATION REACTION

(References are on page 546)

Importance:

[*Seminal Publications*[1-6]; *Reviews*[7-12]; *Modifications & Improvements*[13-24]]

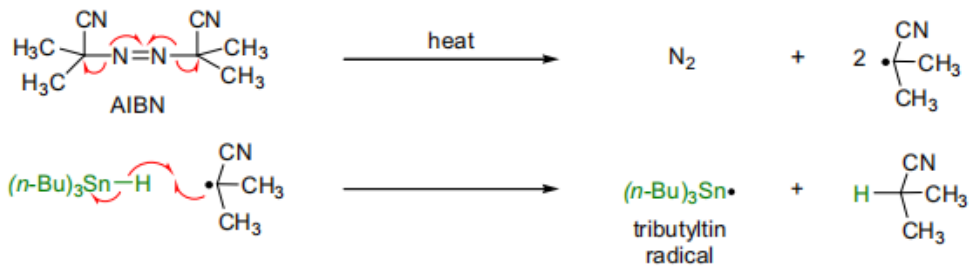
In the *Barton-McCombie radical deoxygenation* reaction the hydroxyl group of an alcohol is replaced with a hydrogen atom. Even hindered secondary and tertiary alcohols may be deoxygenated by this method. In a typical procedure the alcohol is first converted to a thioxoester derivative, which is then exposed to tri-*n*-butyltin hydride in refluxing toluene.



Y = SMe, imidazolyl, OPh, OMe; X = Cl, imidazolyl; base: NaH

Mechanism: [25,13,26]

Initiation step:



Propagation step: