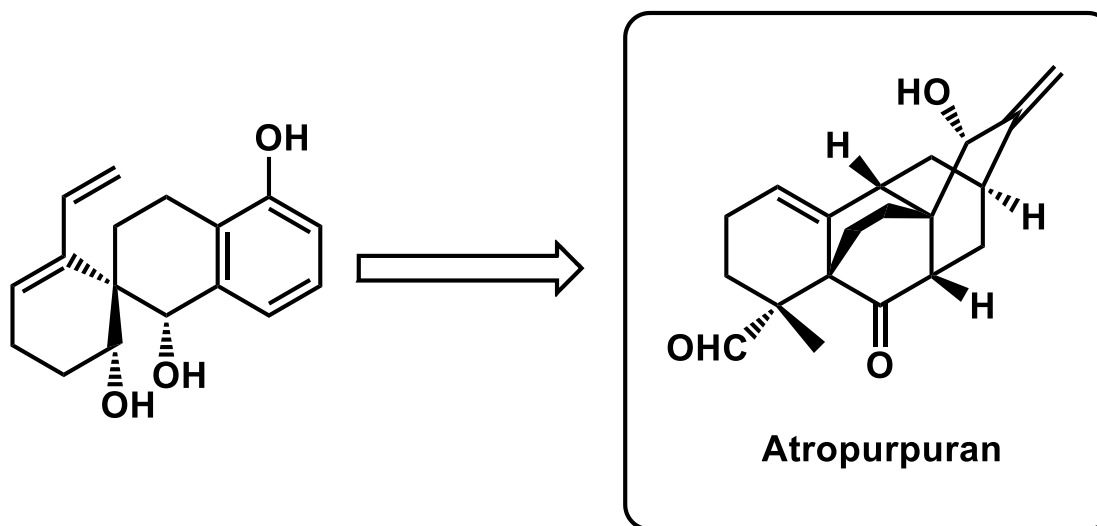


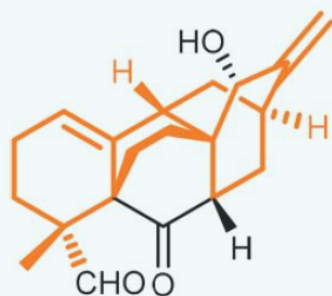
13-Step Total Synthesis of Atropurpuran

Shengling Xie,[‡] Gui Chen,[‡] Hao Yan,[‡] Jieping Hou, Yongping He, Tongyun Zhao, and Jing Xu^{*ID}

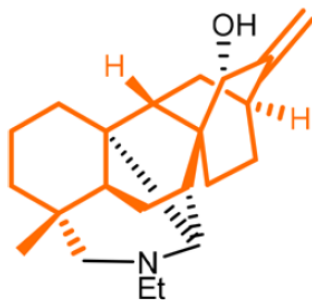
Department of Chemistry and Shenzhen Grubbs Institute, Southern University of Science and Technology, Shenzhen, Guangdong 518055, China



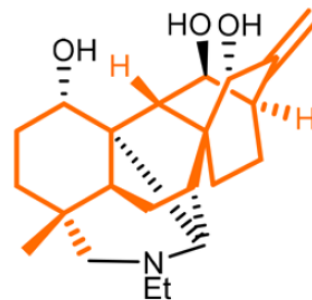
DOI: 10.1021/jacs.9b00391



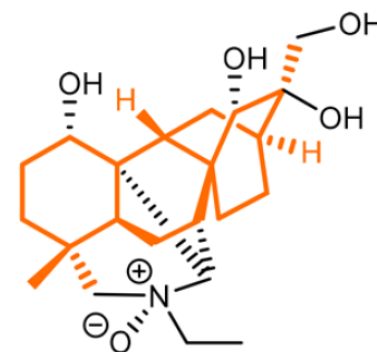
Atropupuran, 1
(arcutane type)



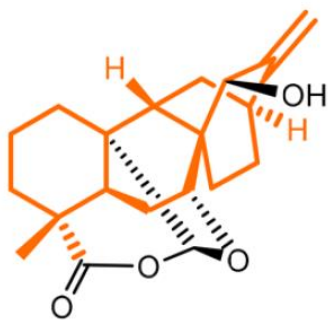
Gymnandine
(denudatine type)



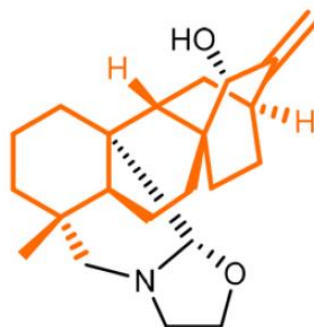
Lepenine
(denudatine type)



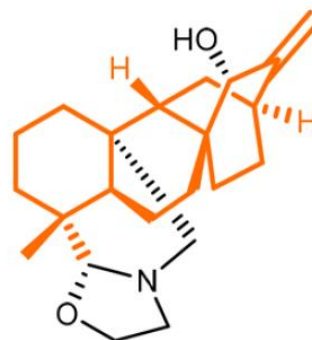
Paniculamine
(denudatine type)



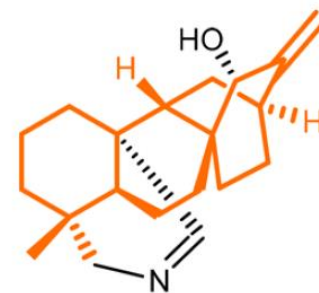
Spiramilactone B
(atisane type)



Atisine
(atisine type)



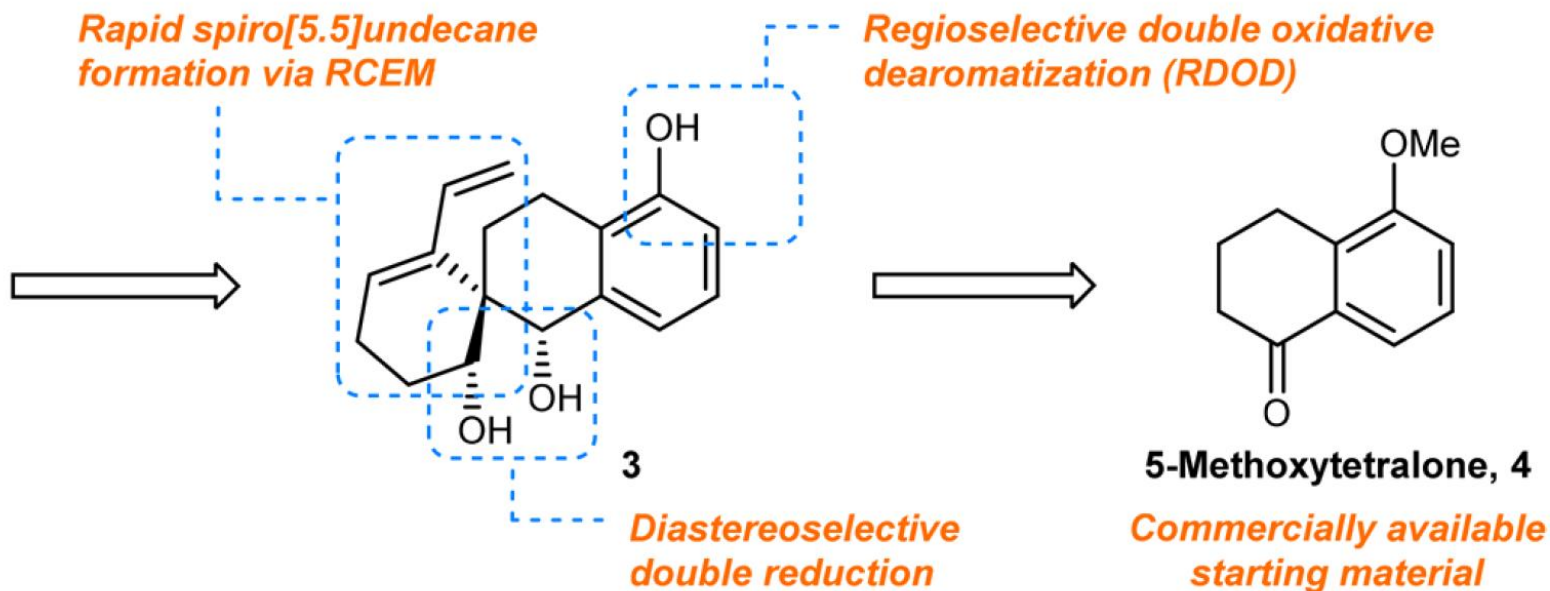
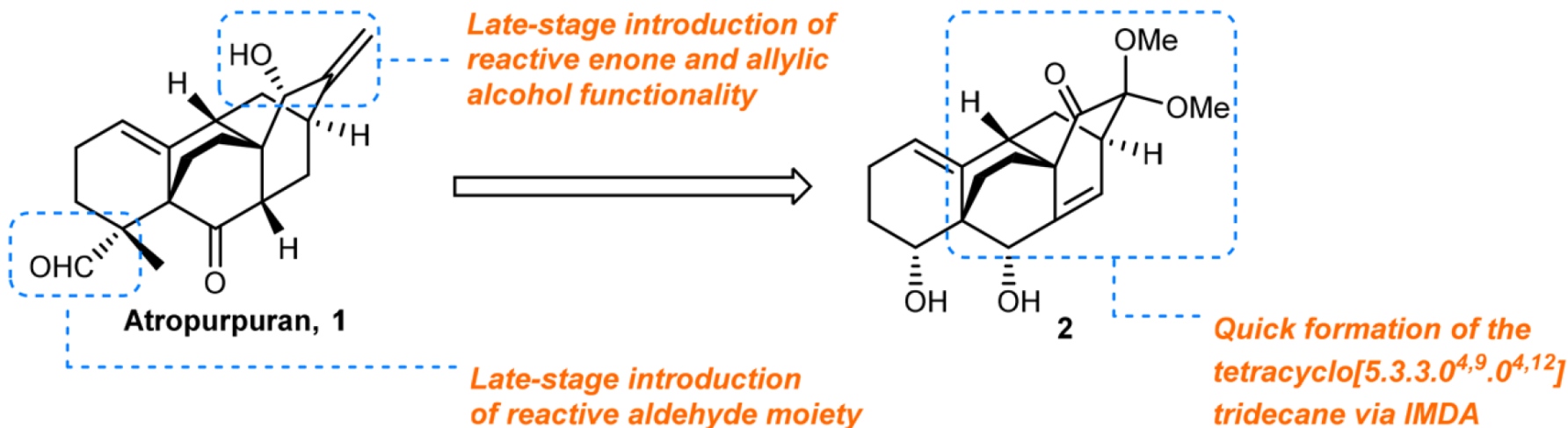
Isoatisine
(atisine type)

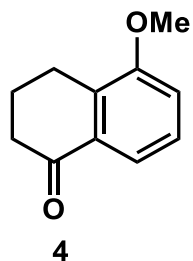


Azitine
(atisine type)

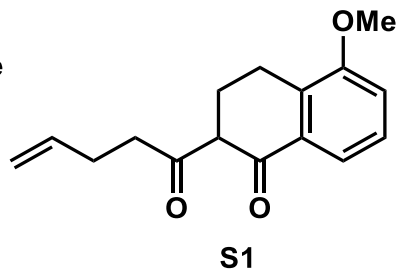
- Isolated from genus *Aconitum* by the Wang's group in 2009
- Its biological properties remain unknown
- It contains two contiguous bicyclo[2.2.2]octane motifs

Retrosynthetic Analysis of 1

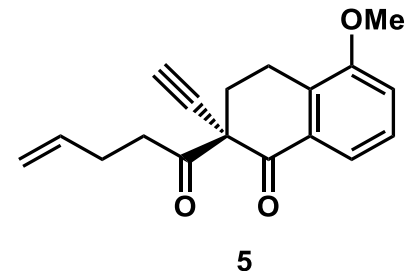




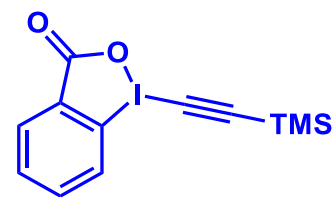
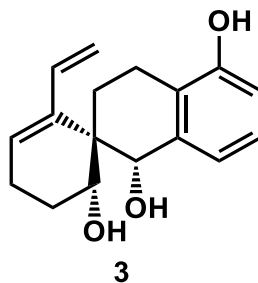
1) LiHMDS
4-pentenoyl chloride
THF, 24 h, 80%



2) TBAF, TMS-EBX
THF, 12 h, 92%

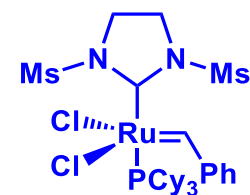


3) Grubbs-II Catalyst
CH₂Cl, rt, 12 h;
-78 °C, BBr₃, 2 h;
AlCl₃/LiAlH₄, 10 min, 50%



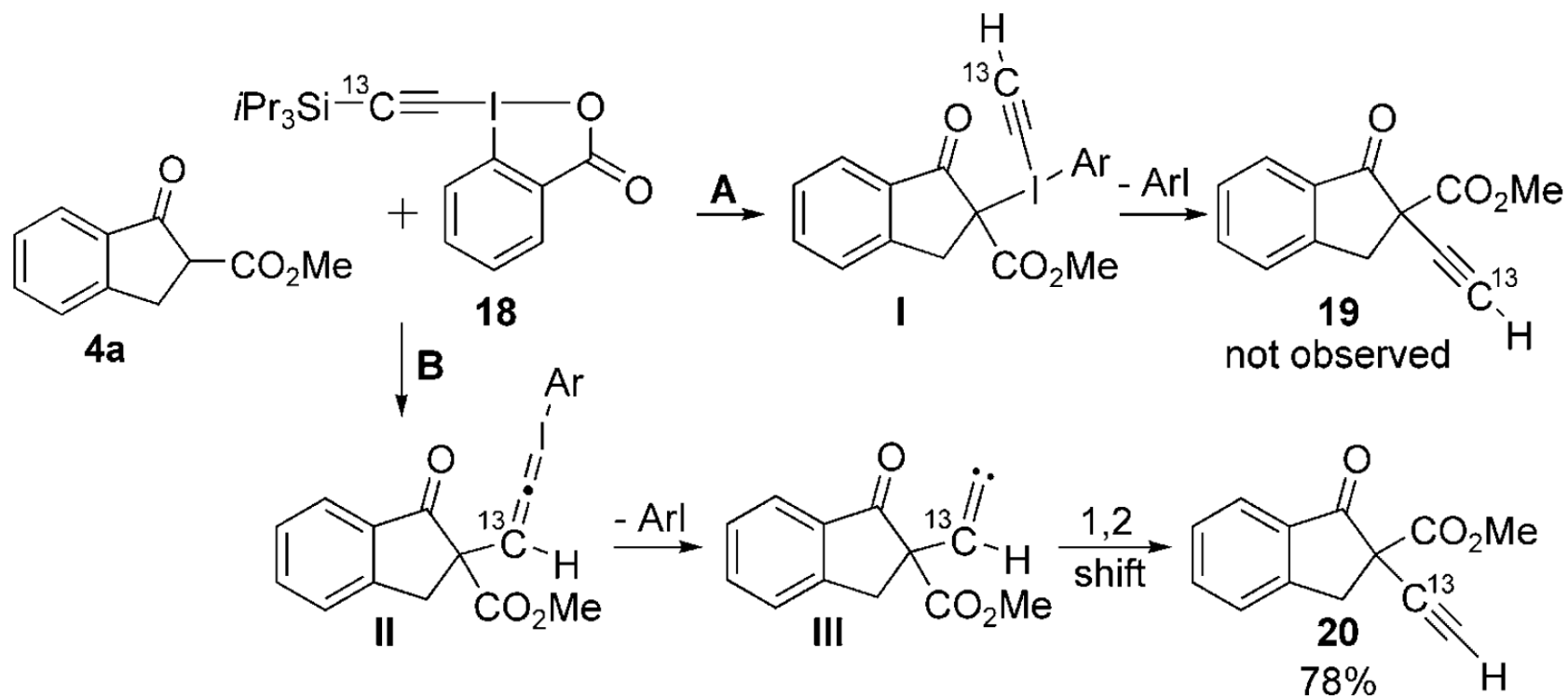
TMS-EBX

Waser's reagent

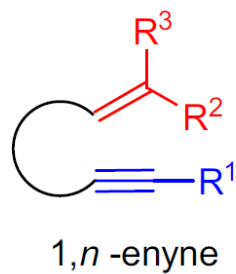


Grubbs-II Catalyst

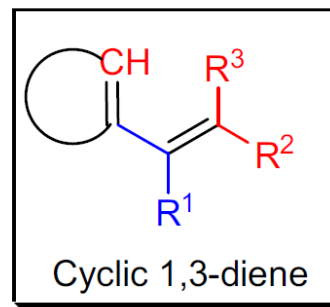
Possible mechanisms for the ethynylation reaction



ENYNE METATHESIS

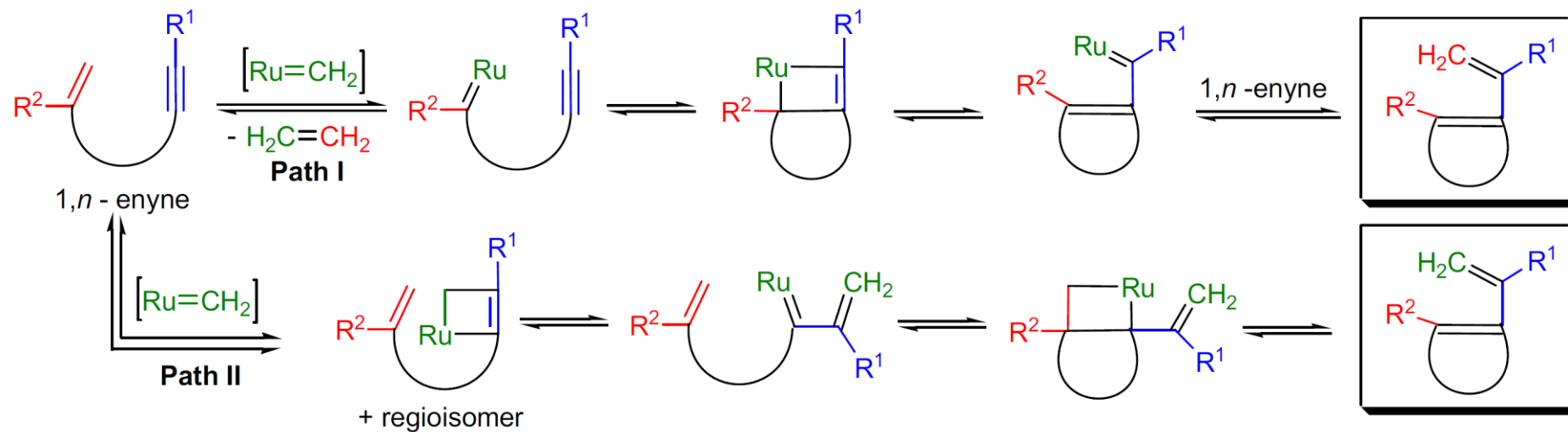


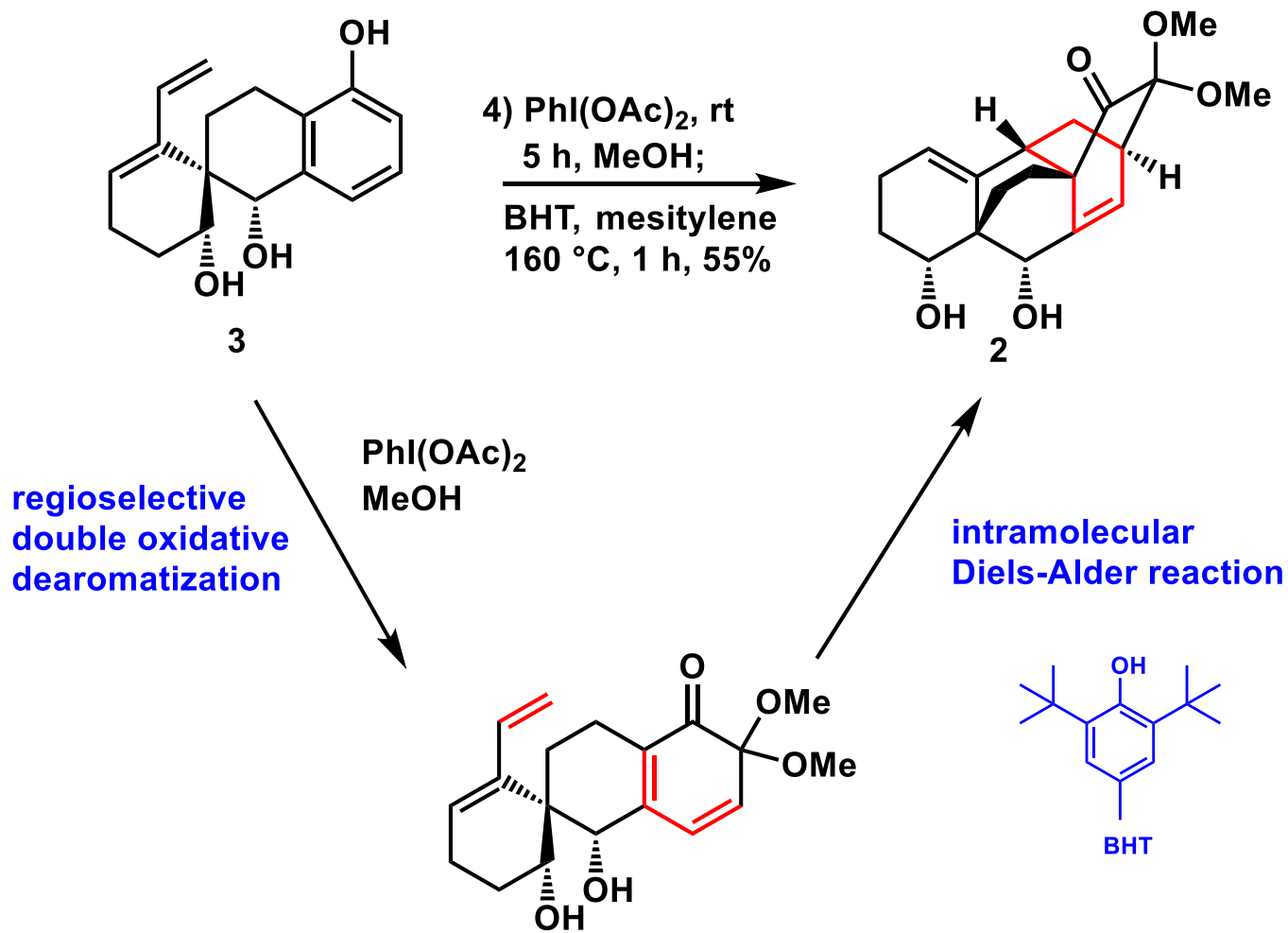
catalyst

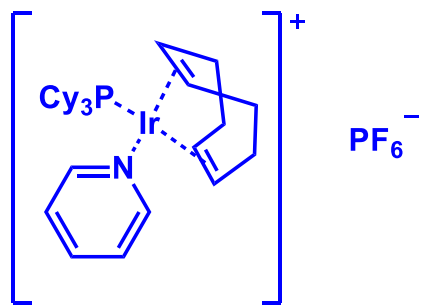
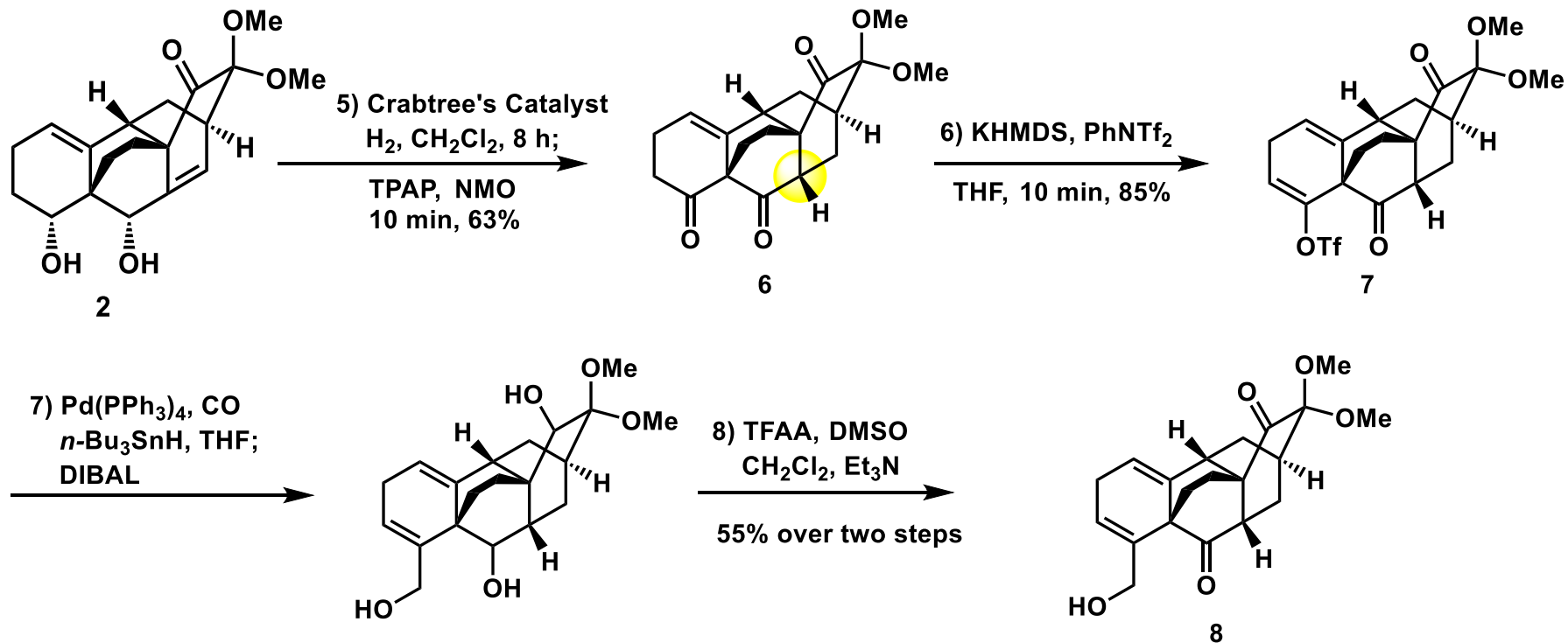


Ring-closing enyne metathesis

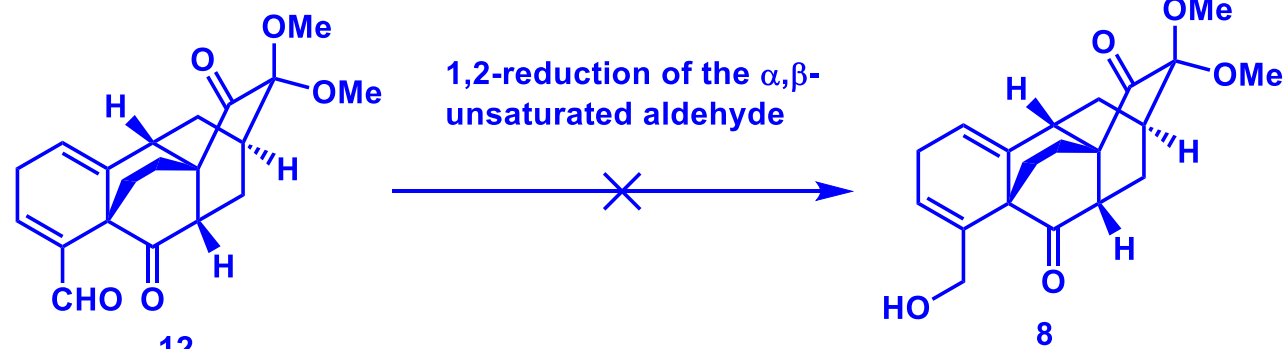
Mechanism:



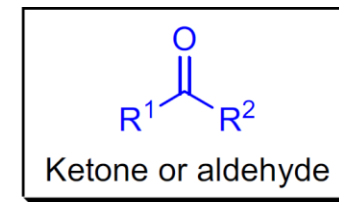
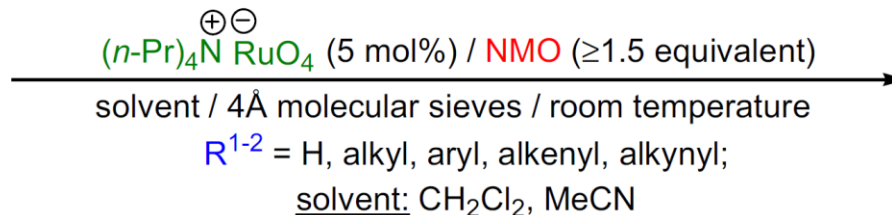
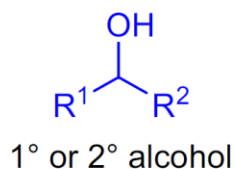




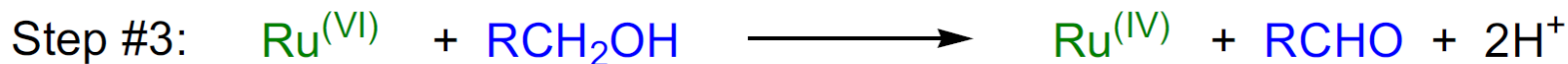
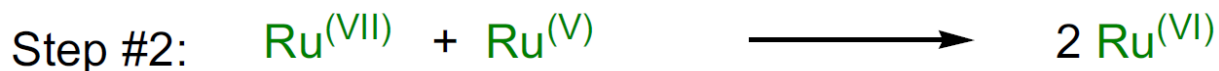
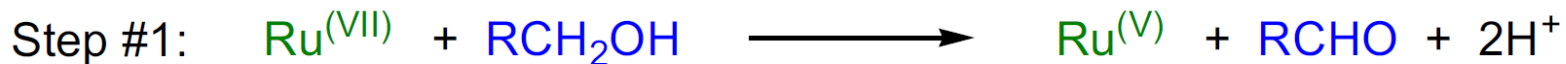
Crabtree's Catalyst



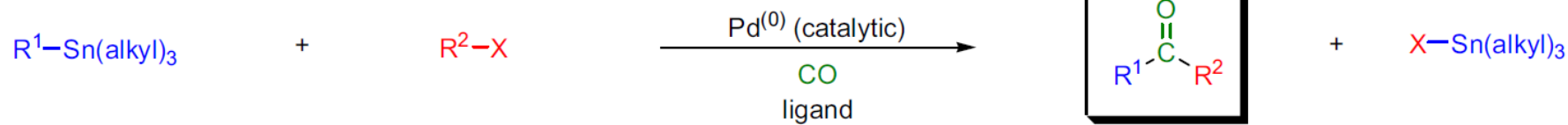
LEY OXIDATION



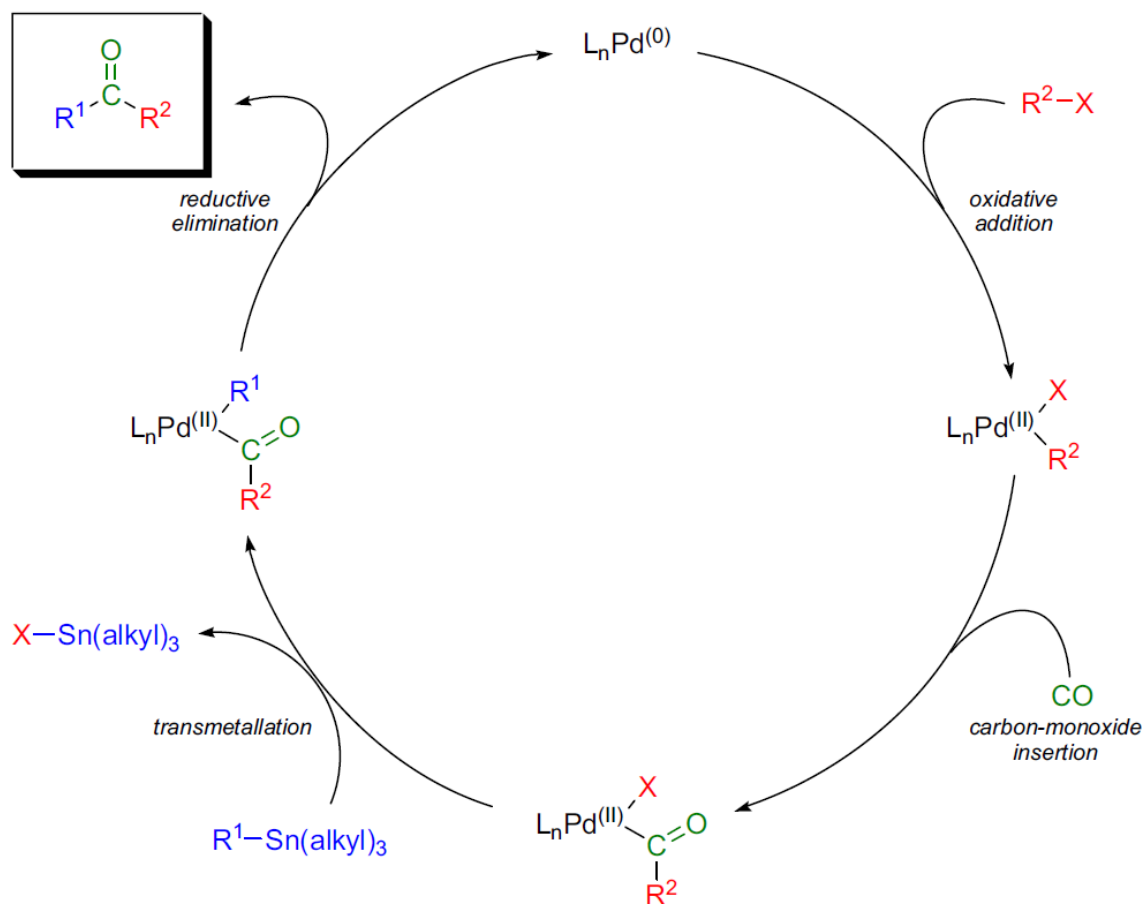
Mechanism:



STILLE CARBOXYLATIVE CROSS-COUPLING

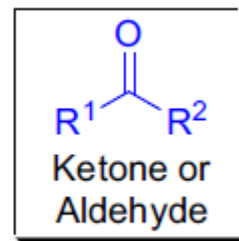
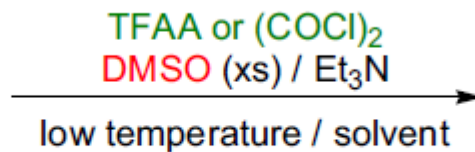
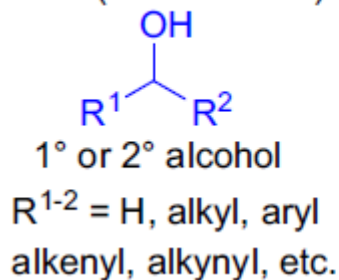


Mechanism:



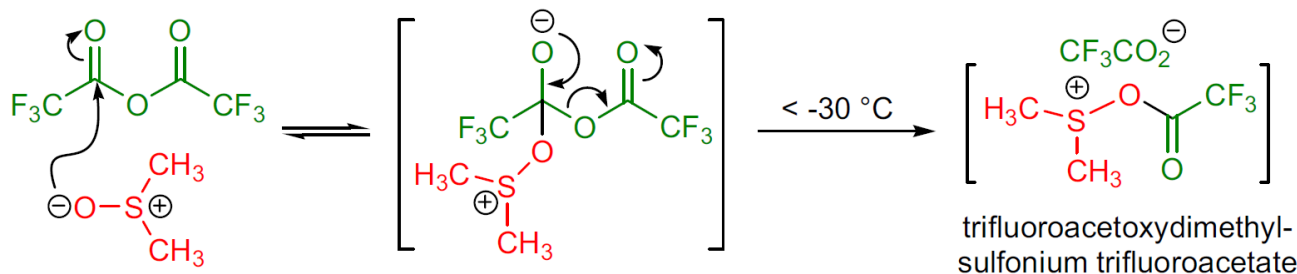
SWERN OXIDATION

Swern (1976 & 1978):

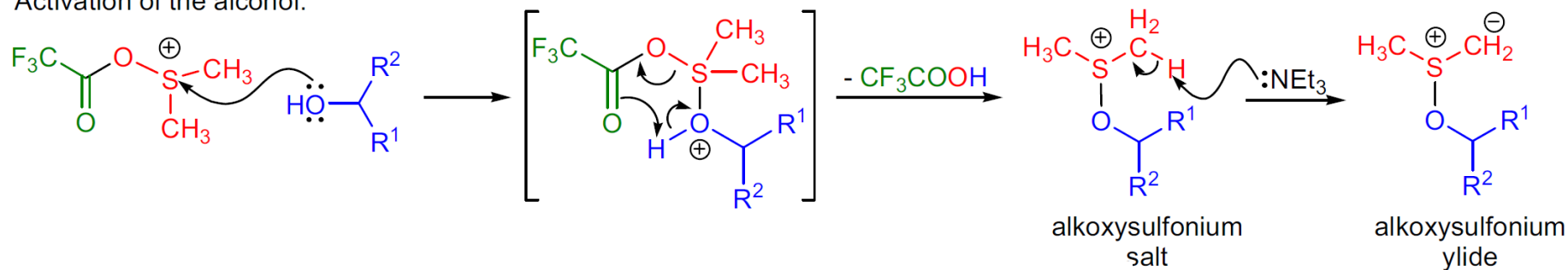


Mechanism:

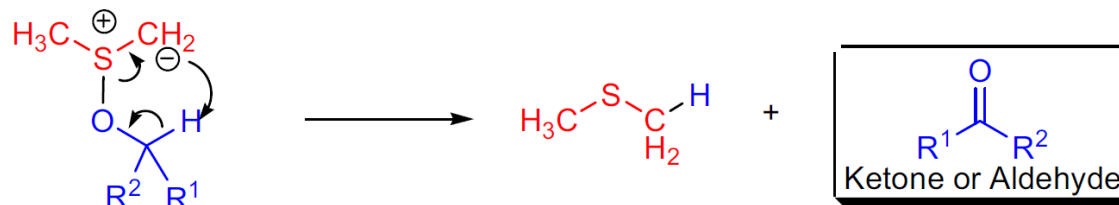
Activation of DMSO with TFAA:

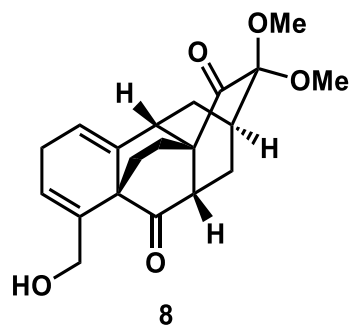


Activation of the alcohol:

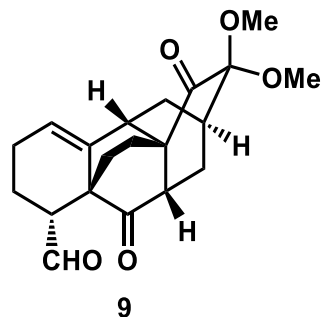


Formation of the product:

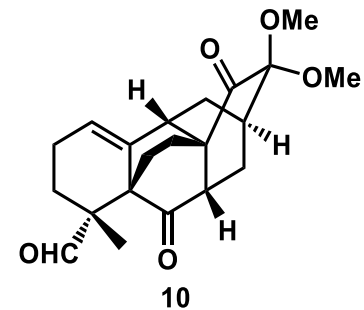




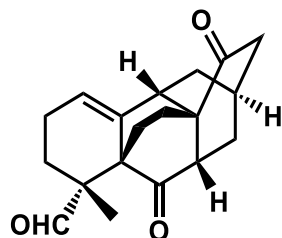
9) Crabtree's Catalyst
 H_2 , CH_2Cl_2 , 1 h;
 Dess-Martin periodinane
 1 h, 68%



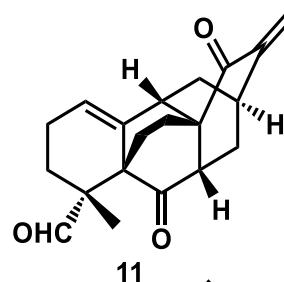
10) $t\text{-BuOK}$, $t\text{-BuOH}$
 MeI , 26 °C
 2 h, 42%
 dr=3:1



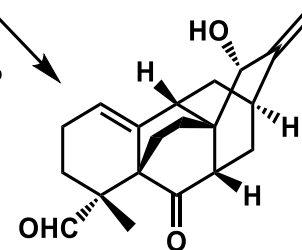
11) SmI_2 , THF, MeOH
 25 °C, 20 min



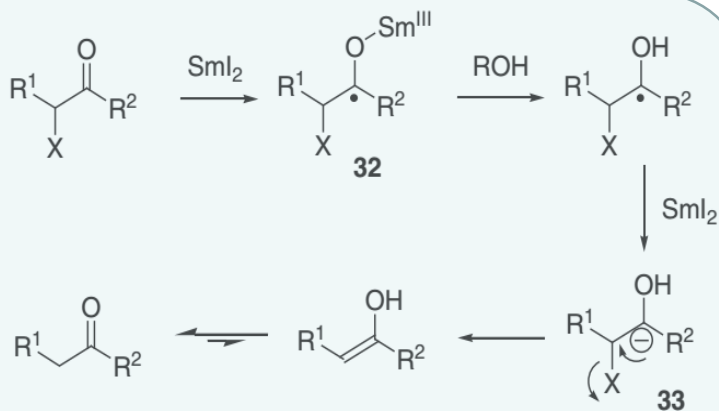
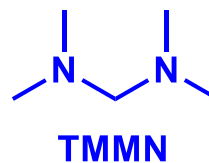
12) TMMN, Ac_2O
 DMF , 95 °C, 6 h
 57% over two steps



13) $\text{NaBH}(\text{OMe})_3$
 THF , MeOH, 72%

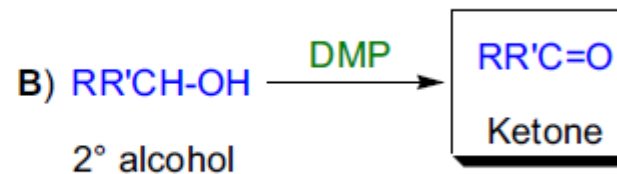
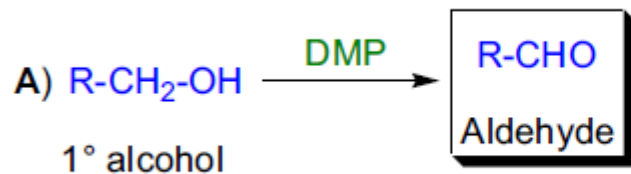


Atropurpuran, 1



X = Hal, OH, OR, OAc
 $\text{S}(\text{O})_n\text{R}$ ($n = 0-2$), NR_2

DESS-MARTIN OXIDATION



Mechanism:

