Total Synthesis of the Diterpenoid Alkaloid Arcutinidine Using a Strategy Inspired by Chemical Network Analysis

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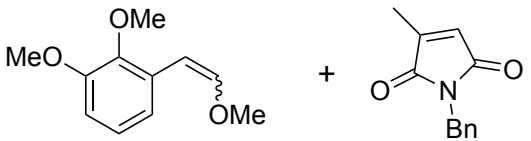

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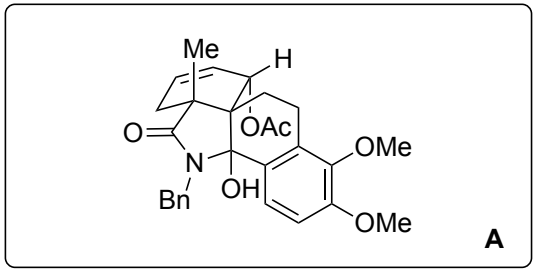

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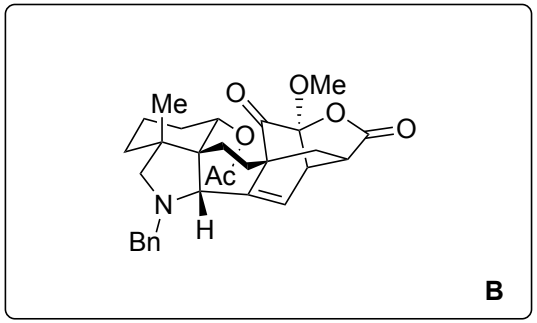
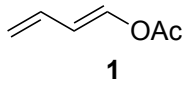


1) PPh_3, AcOH, 125 °C
2) DBU, THF
3) TfOH, CH_2Cl_2
4) **1**, $AlCl_3$, CH_3CN, 40 °C
single diastereomer!



1

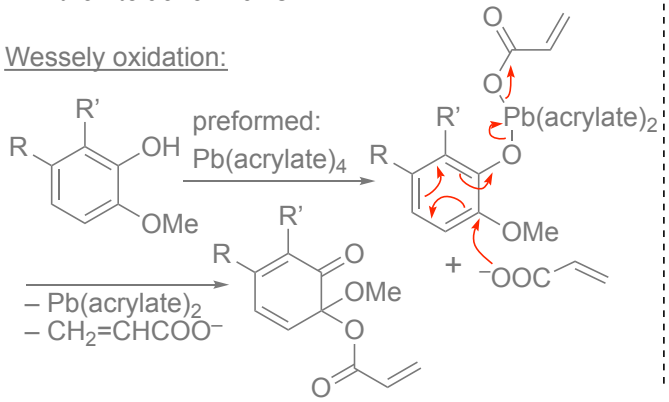
1): is a modified version of what named reaction? Wittig reaction
hint: in 2) an isomerization is performed
3) and 4): name the reactions
Friedel-Crafts cyclization and Diels-Alder cycloaddition

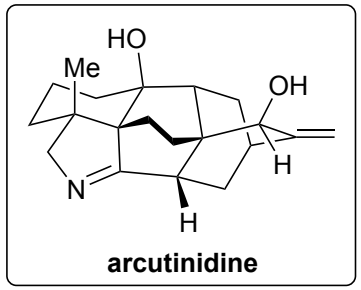
5) Rh/Al_2O_3, EtOAc, H_2
6) $BF_3{\bullet}OEt_2$, Et_3SiH
7) $LiAlH_4$
8) Ac_2O, DMAP, pyridine
9) TMSI
10) acrylic acid (60 equiv.), $Pb(OAc)_4$, 0 °C
then toluene 110 °C

5): what are common metals used in heterogeneous hydrogenations, order them based on their general reactivity?
Pt > Pd > Rh ~ Ru > Ni

10): name reactions and propose a mechanism for the first
Wessely oxidation, Diels-Alder; mech. below

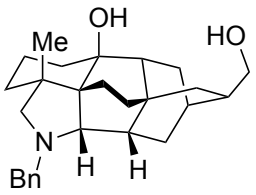
Wessely oxidation:





arcutinidine

11-18



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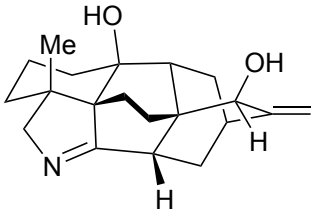
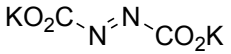
19-23



arcutinidine

11) MeOH, then SmI_2/H_2O, 23 ºC
12) Amberlyst® 15, MeOH, 100 ºC microwave
13) DMP, $NaHCO_3$, H_2O
14) SmI_2, 23 ºC
15) **2**, AcOH, MeOH, 50 ºC
16) $InCl_3$, Ph_2SiHCl
17) $LiAlH_4$
18) $Mn(dpm)_3$, $PhSiH_3$, EtOH, O_2



2

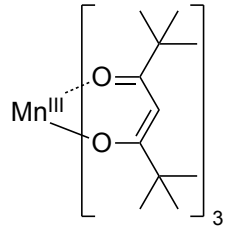
19) $Pd(OH)_2/C$, H_2
20) NCS, DBU
21) MsCl, Et_3N, 23 ºC
22) DBU, NaI, 80 ºC
23) SeO_2

note: Amberlyst® 15 is a polystyrene based ion exchange resin with sulfonic groups

hint: in 16) an elimination is followed by a dehydration

18): name reaction Mukaiyama hydration

$Mn(dpm)_3$:



23): name reaction Riley oxidation