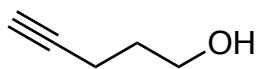


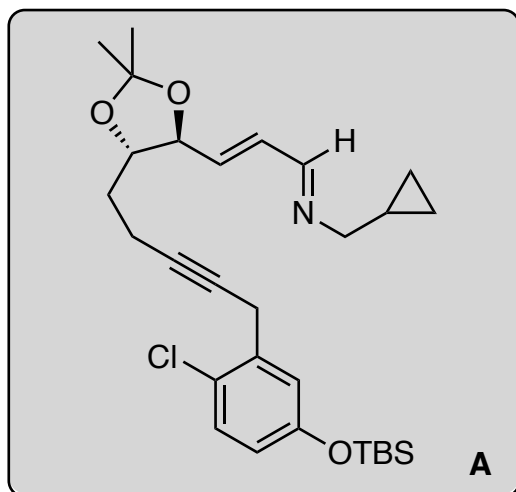
Synthesis of *ent*-Ketorfanol via a C-H Alkenylation/Torquoselective 6 π Electrocyclization Cascade

Phillips, E. M.; Mesganaw, T.; Patel, A.; Duttwyler, S.; Mercado, B. Q.; Houk, K. N.; Ellman, J. A.

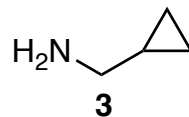
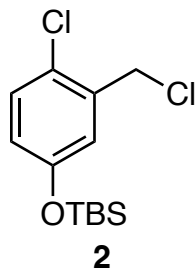
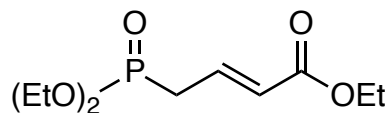
Angew. Chem. Int. Ed. **2015**, *54*, 12044-12048.



1-8



- 1) (COCl)₂, DMSO, Et₃N, CH₂Cl₂, -78 to 25 °C
- 2) **1**, *n*-BuLi, *i*-Pr₂NH, THF, -78 to 0 °C
- 3) AD-mix- α , MeSO₂NH₂, H₂O, *t*-BuOH, 0 °C
- 4) 2,2-dimethoxypropane, *p*-TSA (cat.), CH₂Cl₂, 0 °C
- 5) **2**, PdCl₂(CH₃CN)₂, XPhos, CsCO₃, THF, 65 °C
- 6) DIBAL-H, THF, -78 °C
- 7) DMP, pyridine, CH₂Cl₂, 0 °C
- 8) **3**, 3Å MS, toluene, 25 °C



- 2) Name of reaction

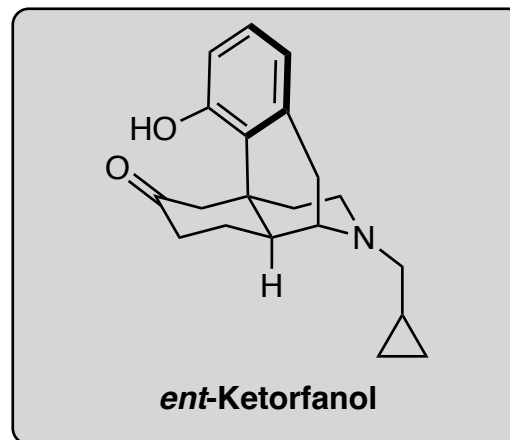
Horner-Wadsworth-Emmons

- 3) Components of AD-mix- α ?

K₂OsO₄ · 2H₂O, (DHQ)₂PHAL, K₃Fe(CN)₆, K₂CO₃

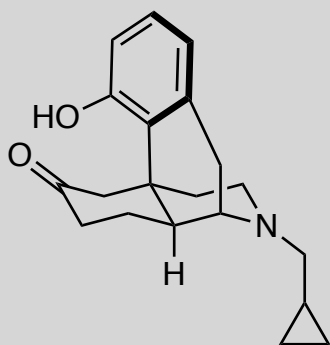
- 5) Name of reaction?

Heck alkylation



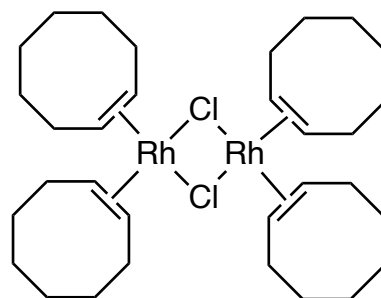
A

9-12



ent-Ketorfanol

- 9) **4** (cat.), 4-(diethylphosphino)-*N,N*-dimethylaniline, toluene, 65 °C
- 10) NaHB(OAc)₃, AcOH, EtOH, 0 to 25 °C
- 11) aq. H₃PO₄, 125 °C
- 12) Pd/C (cat.), H₂, NaHCO₃, EtOH, 25 °C



4, [RhCl(coe)₂]₂

9) *Hint*: intramolecular alkenylation / 6π electrocyclization

11) *Hint*: a pinacol rearrangement occurs

