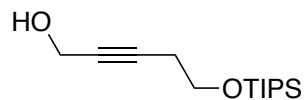


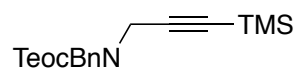
# Unified Total Synthesis of Madangamines A, C, and E

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1-5

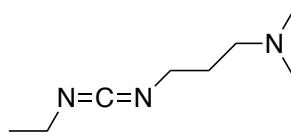


6-14



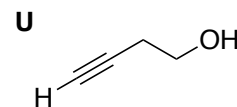
- 1) KOH, *p*-TsCl
- 2) **U**, CuI/NaI, K<sub>2</sub>CO<sub>3</sub>
- 3) Ni(OAc)<sub>2</sub>·4H<sub>2</sub>O, NaBH<sub>4</sub>
- 4) MsCl, Et<sub>3</sub>N, THF, 0 °C  
then LiBr, 50 °C
- 5) PPh<sub>3</sub>, MeCN, 85 °C

EDAC =

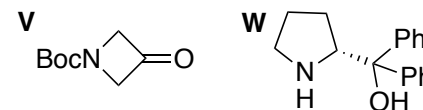


- 6) **V**, Ni(cod)<sub>2</sub>, PPh<sub>3</sub>, PhMe, 60 °C
- 7) **W** (cat.), B(OMe)<sub>3</sub>, BH<sub>3</sub>·Me<sub>2</sub>S
- 8) *t*-BuOK
- 9) 2-PyCO<sub>2</sub>H, EDAC, DMAP
- 10) TIPSO(CH<sub>2</sub>)<sub>3</sub>MgBr, ZnI<sub>2</sub>  
CuBr·Me<sub>2</sub>S
- 11) Na, NH<sub>3</sub>, THF/*t*-BuOH, -78 °C
- 12) **X**, NaH, TBAI
- 13) *n*-BuLi, ClCO<sub>2</sub>CH<sub>3</sub>, THF, -78 °C
- 14) Pd<sub>2</sub>dba<sub>3</sub>·CHCl<sub>3</sub> (2 mol%),  
HCO<sub>2</sub>H

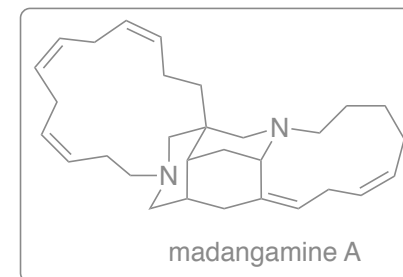
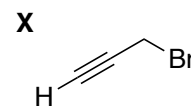
Structure and color of  
Ni(OAc)<sub>2</sub>·4H<sub>2</sub>O?

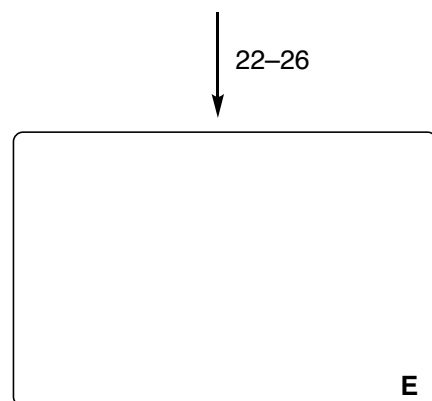
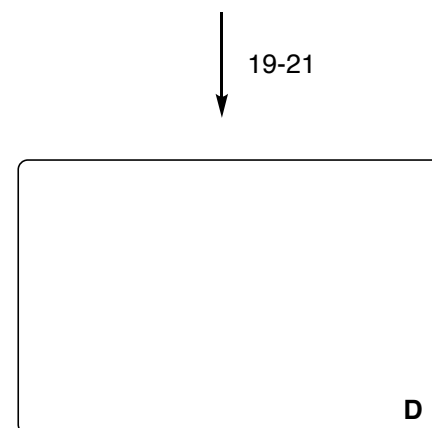
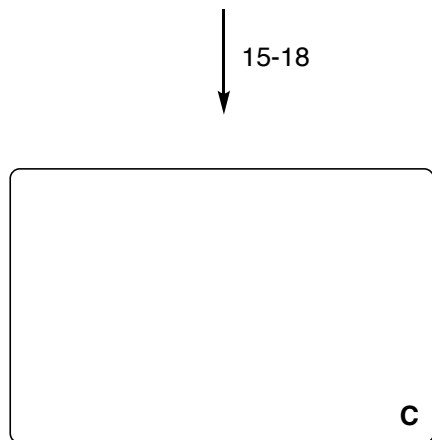


Name of central functional group present in **A**?

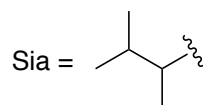


Name of reaction in step 7?



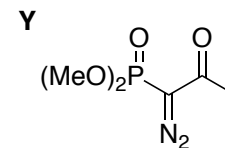
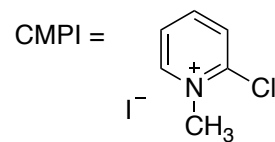


- 15) NaBH<sub>4</sub>, CuCl, EtOH, -20 °C  
 16) MeNHOMe·HCl, *i*-PrMgCl, THF, -20 °C  
 17) DIBAL-H, THF, -78 °C  
 18) **Y**, K<sub>2</sub>CO<sub>3</sub>, MeOH, rt



- 19) TMS, *n*-BuLi  
 20) TFA, MeCN, EtOH, 50 °C  
 21) (Sia)<sub>2</sub>BH, THF, rt  
 then 3M NaOH, H<sub>2</sub>O<sub>2</sub>, 0 °C

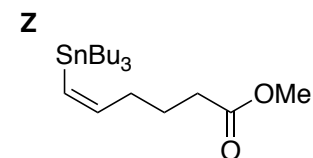
- 22) ClCO<sub>2</sub>CH<sub>3</sub>, py  
 23) **Z**, cat. Pd<sub>2</sub>(dba)<sub>3</sub>·CHCl<sub>3</sub>, LiCl, DMF, rt  
 24) LiOH (aq), THF, 60 °C  
 25) 2,6-lutidine, TMSOTf  
 26) CMPI, *i*-Pr<sub>2</sub>NEt



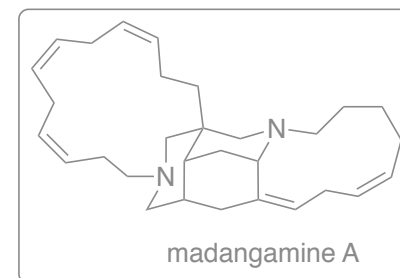
Name of reaction in step 18?

Please provide a detailed arrow-pushing mechanism for step 20.

*Hint for step 21: Z/E = 20.4:1*



*Hint for step 23: (Z,Z)/(E,Z) = 14.3:1*



↓ 27-34  
madangamine A

- 27) CSA, MeOH, 40 °C
- 28) cat. AZADOL<sup>®</sup>, PhI(OAc)<sub>2</sub>
- 29) **A**, NaHMDS
- 30) CSA, MeOH, 40 °C
- 31) *p*-TsCl, Et<sub>3</sub>N, DMAP
- 32) BF<sub>3</sub>·OEt<sub>2</sub>, CH<sub>2</sub>Cl<sub>2</sub>, rt
- 33) *i*-PrNEt<sub>2</sub>, MeCN, 70 °C
- 34) LiAlH<sub>4</sub>, THF, rt

