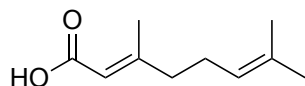
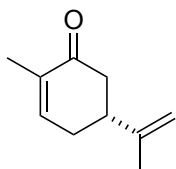
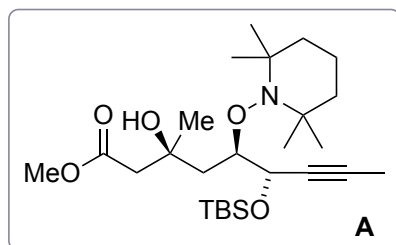


Total Synthesis of (-)-Sinulariadiolide. A Transannular Approach

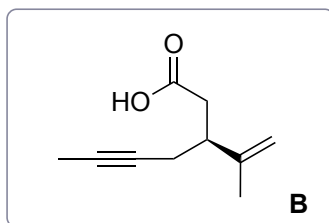
Z. Meng, A. Fürstner, *J. Am. Chem. Soc.* **2019**, *141*, 805–809.



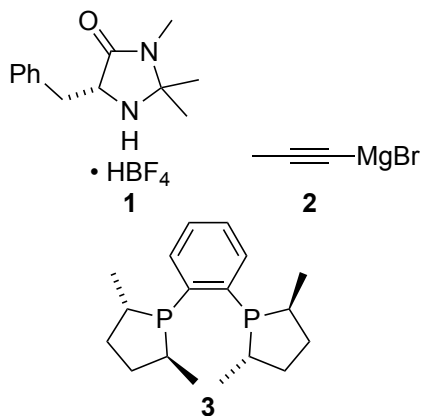
1 – 6



7 – 9



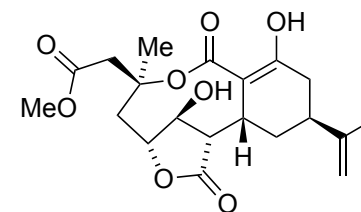
- 1) Me_2SO_4 , DIPEA, then O_3 , then PPh_3
- 2) **1**, CuCl_2 , TEMPO, air
- 3) **2**
- 4) TBSCl, imH
- 5) $\text{B}_2(\text{pin})_2$, *t*-BuONa, CuCl, **3**
- 6) $\text{NaBO}_3 \cdot 6\text{H}_2\text{O}$



- 7) H_2O_2 , NaOH
- 8) TsNHNH_2 , HOAc
- 9) NaClO_2 , NaH_2PO_4 , amlene, H_2O

- 1) Name of the starting material? Geranic acid
- 2) Propose a mechanism. [see below](#)
- 3) Explain the stereoselectivity based on the Felkin-Anh model. [see below](#)

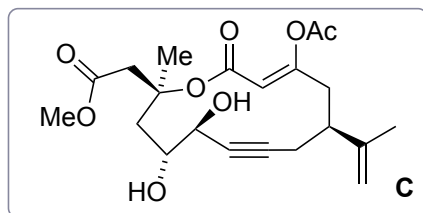
- 7) Name of the starting material? (*R*)-carvone
- 8) Name of the reaction? Eschenmoser-Tanabe fragmentation
- 9) Name of the reaction? Pinnick-Lindgren-Kraus oxidation



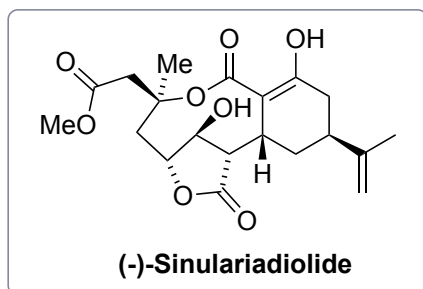
(-)-Sinulariadiolide

B

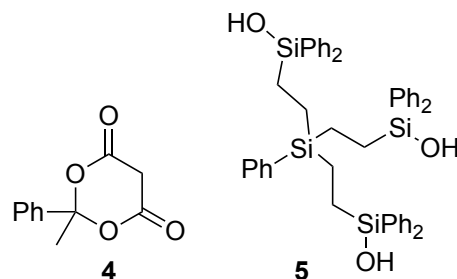
10 - 15



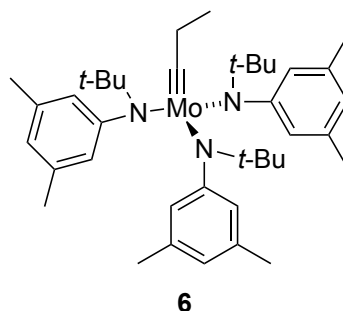
16 - 20



- 10) DCC, DMAP, NEt_3 , **4**
- 11) **A**, 60 °C
- 12) Ac_2O , DMAP, NEt_3
- 13) aq. HF
- 14) **5**, **6**
- 15) Zn, HOAc



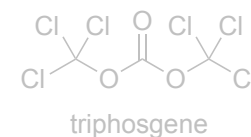
- 16) Bu_3SnH , $[\text{Cp}^*\text{RuCl}]_4$
- 17) CO, $\text{Pd}(\text{OAc})_2$, AsPh_3 , 1,4-benzoquinone, CF_3COOH , MeOH
- 18) triphosgene, py
- 19) Cs_2CO_3 , MeOH
- 20) BBr_3



11) Propose a mechanism. [see below](#)

14) Hint: Step 12 caps a functionality, which would disturb the reaction in step 14. Step 13 reduces the sterical hindrance to enable the transformation in step 14.

- 16) Hint: *trans*-addition; The regioselectivity is controlled through coordination of the propargylic alcohol to the Ru-catalyst.
- 17) Hint: 1,4-benzoquinone serves as a stoichiometric oxidant. Trifluoroacetic acid is a cocatalyst. The acid lowers the LUMO of the quinone and likely promotes assembly of the substrates. (see also: H. Sommer, A. Fürstner, *Org. Lett.* **2016**, *18*, 3210–3213.)
- 18) Structure of triphosgene?
- 19) Hint: Several bond breaking/formation events take place with the final one being an oxa-Michael addition.



2) M. P. Sibi, M. Hasegawa, *J. Am. Chem. Soc.* **2007**, 129, 4124–4125.

