

*Two Complementary Classes of Catalysts for
Enantioselective Olefin Metathesis*

Amir H. Hoveyda

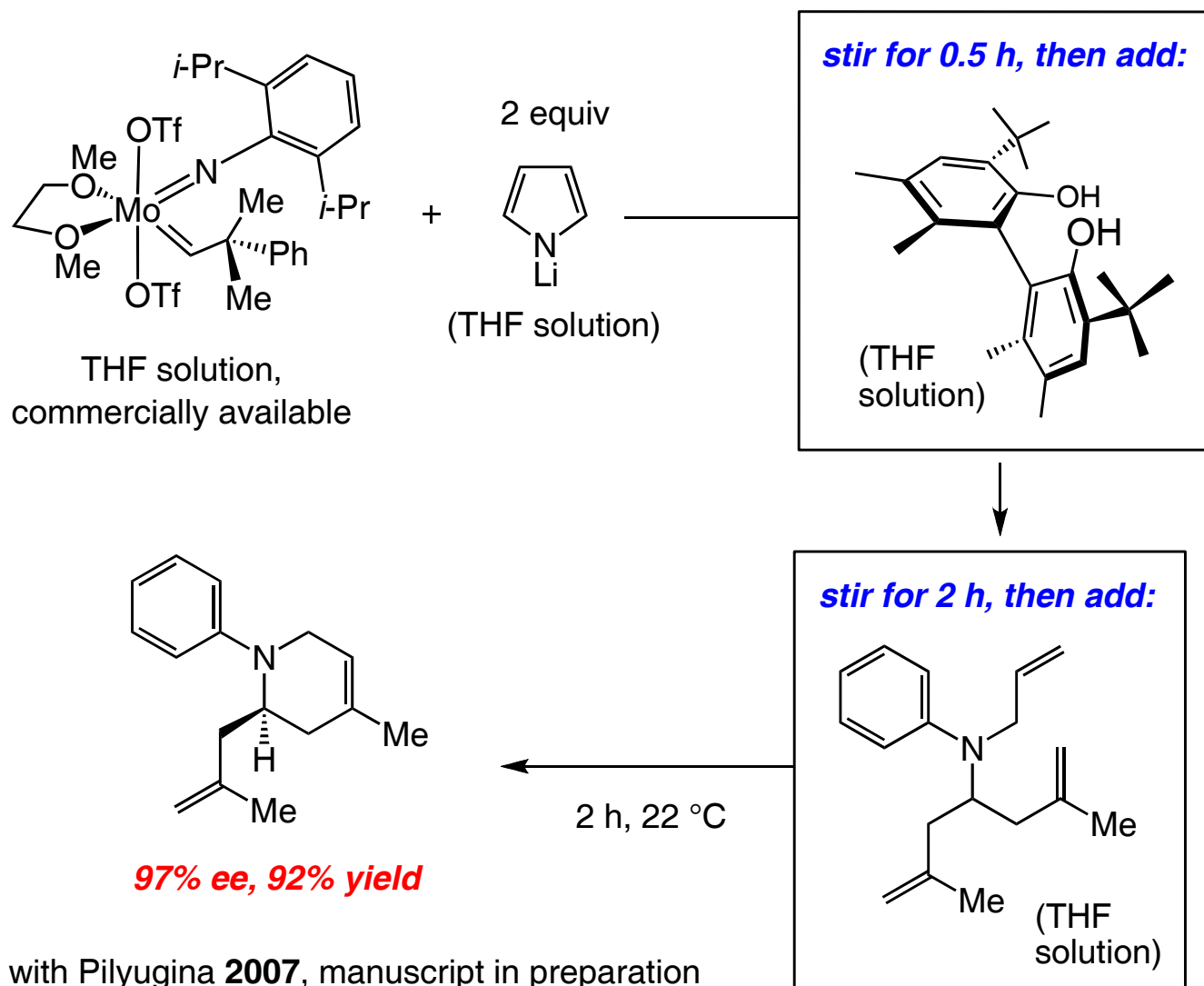
International Symposium on Olefin Metathesis XVII

Pasadena, CA

July 28, 2007

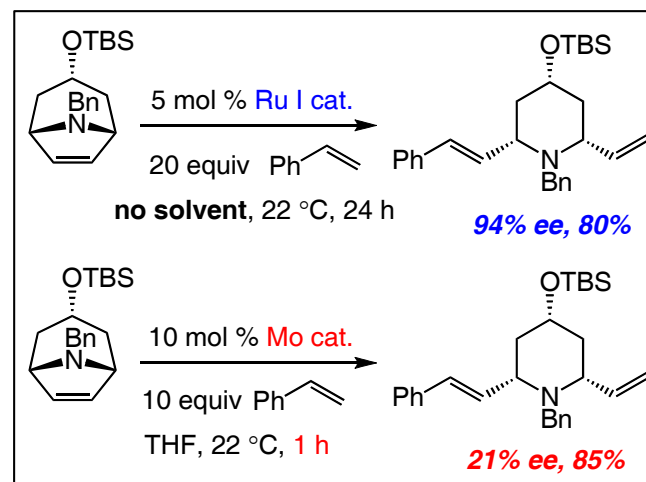
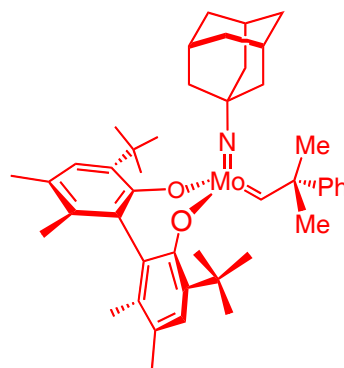
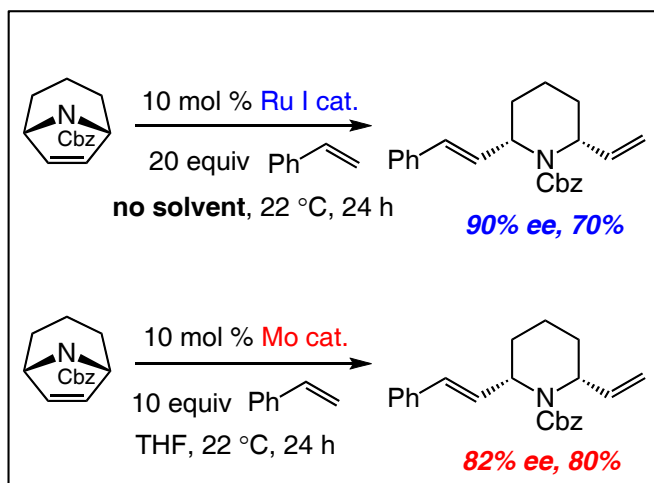
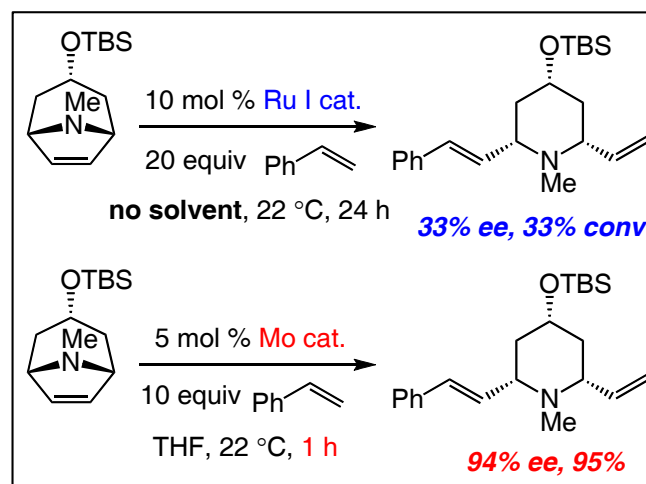
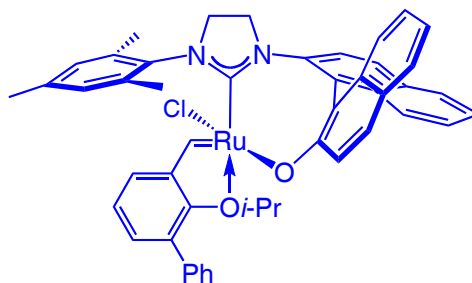
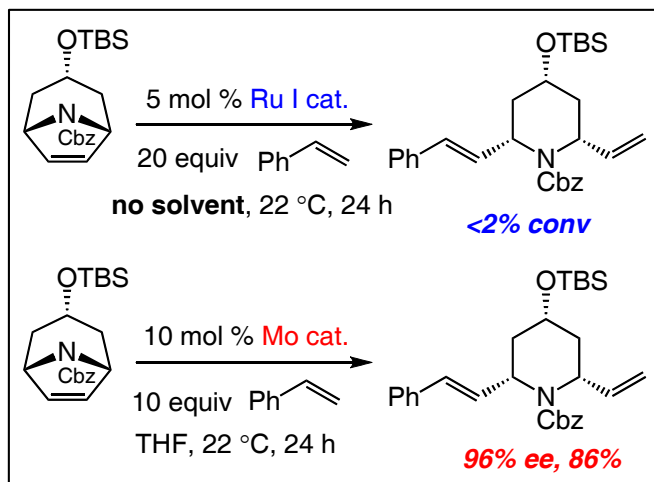
Chiral Mo Catalyst Prepared and Used In Situ

All operations Carried out under N₂ in a Fume Hood



Complementarity of Chiral Ru- and Mo-Based Olefin Metathesis Catalysts

Applications to Enantioselective Synthesis of Functionalized Piperidines



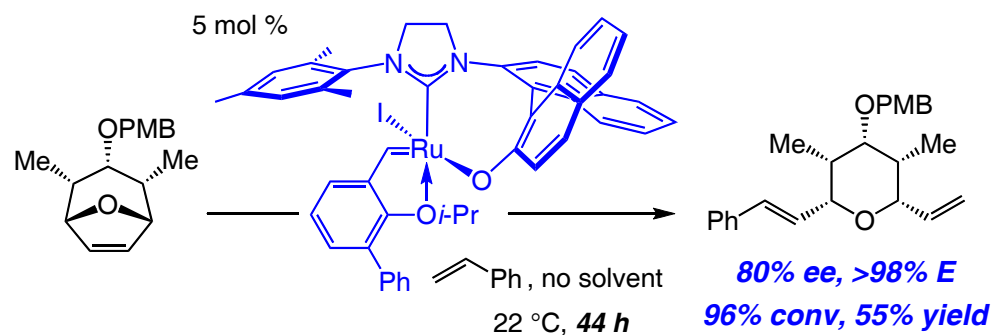
- Chiral Ru and Mo catalysts are complementary.
- The logic for the observed selectivity and reactivity levels is at times unclear.

with Cortez & Baxter *Angew. Chem.* **2007**, 4534; *Org. Lett.* **2007**, 2871

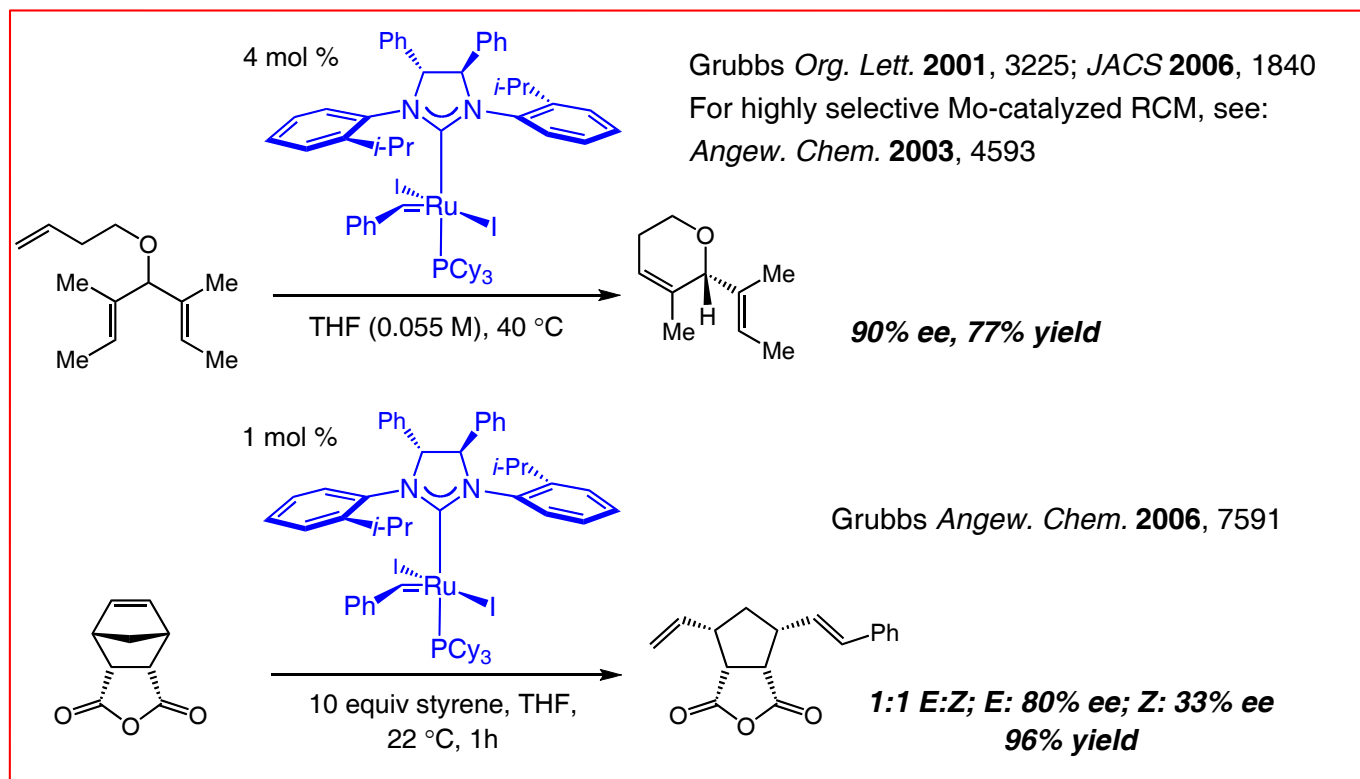
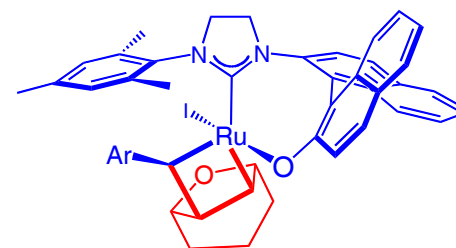
Chiral Bidentate NHC•Ru Complexes in Asymmetric Olefin Metathesis Reactions

Limitations: Driving Force for New Catalyst and Method Development

1. Limitation: Low Catalyst Activity



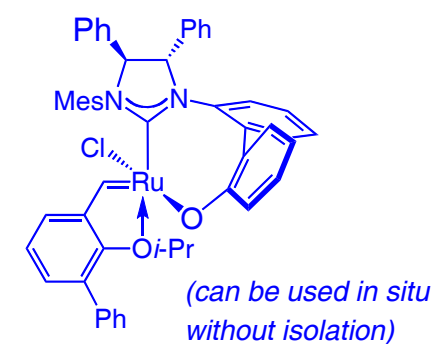
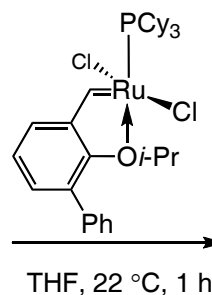
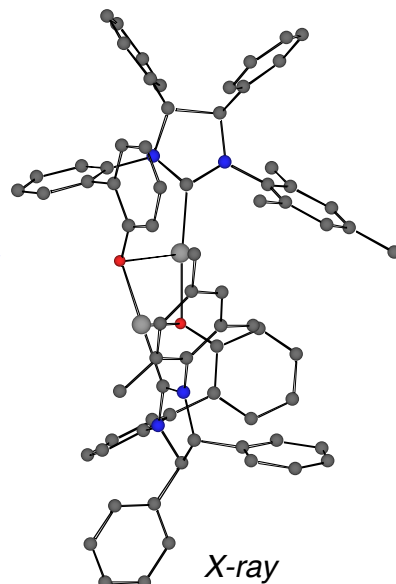
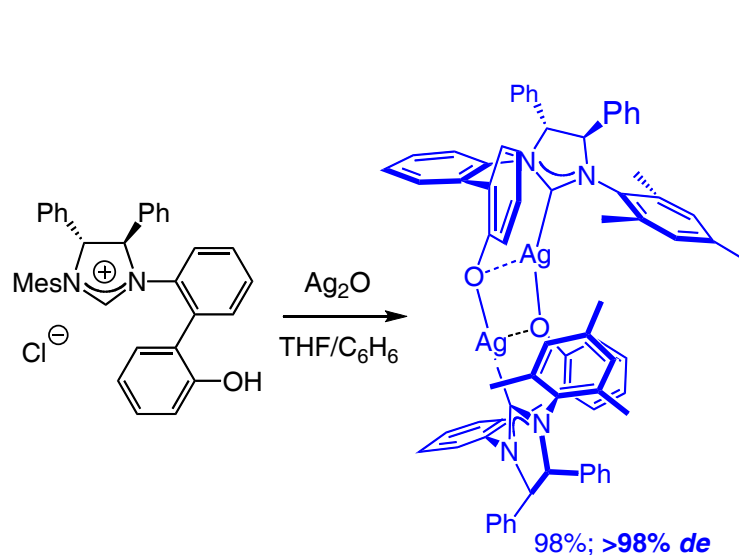
Increase Catalyst Activity by Lowering Strain of Metallacyclobutane Intermediate?



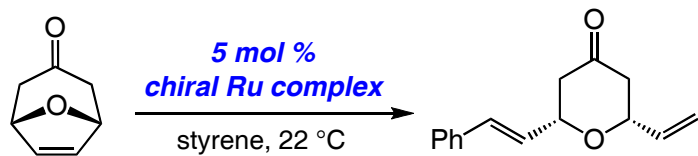
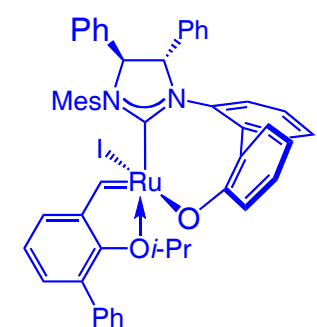
Chiral Bidentate NHC•Ru Complexes in Asymmetric Olefin Metathesis Reactions

Limitations: Driving Force for New Catalyst and Method Development

■ Second-Generation Chiral Ru Catalysts

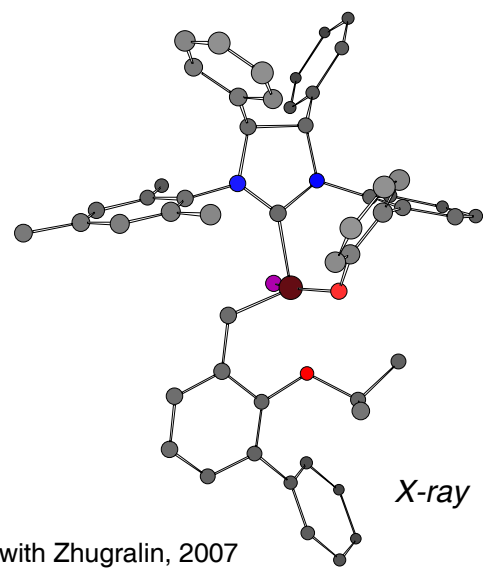


10 equiv NaI
THF, 22 °C, 1 h



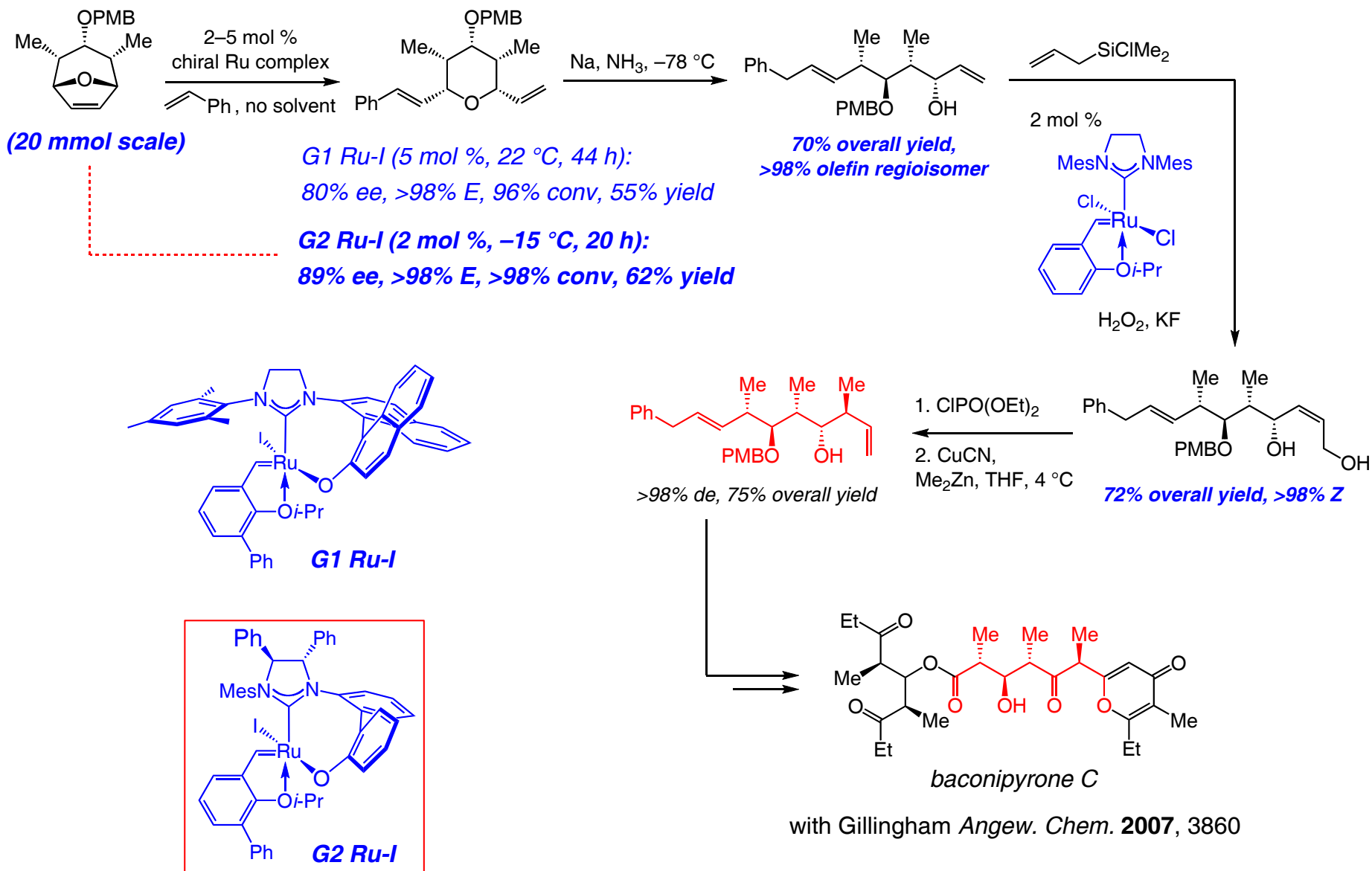
- with G2 Ru-I: >98% conv, 1 h, 84% ee, >98% E, 73%
- with in situ G2 Ru-I: >98% conv, 1 h, 83% ee, >98% E, 87%
- with G1 Ru-Cl: 50% conv, 48 h, 67% ee, >98% E, 66%
- with G1 Ru-I: <2% conv

with VanVeldhuizen, Giudici & Campbell JACS 2005, 6877

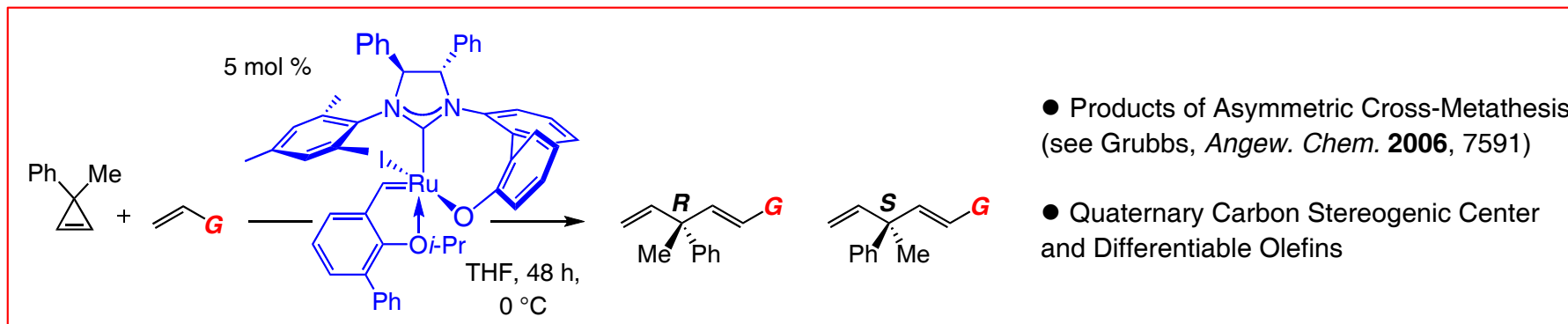


with Zhugralin, 2007

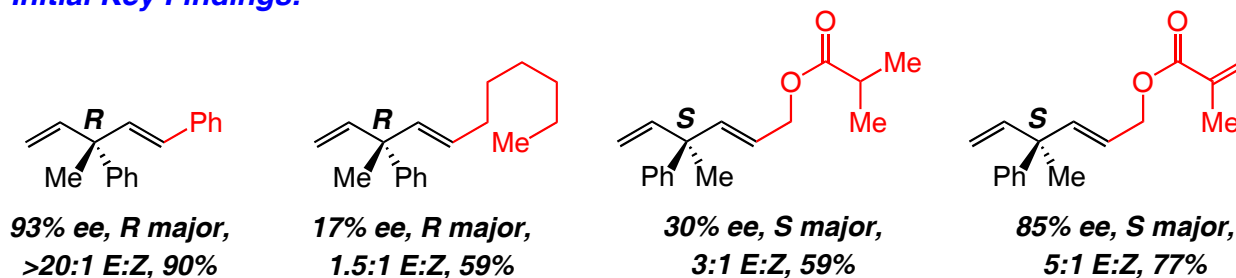
Chiral Bidentate NHC•Ru Complexes in Natural Product Synthesis



Directed Catalytic Olefin Metathesis: Reactivity and Enantioselectivity Control by Enoates

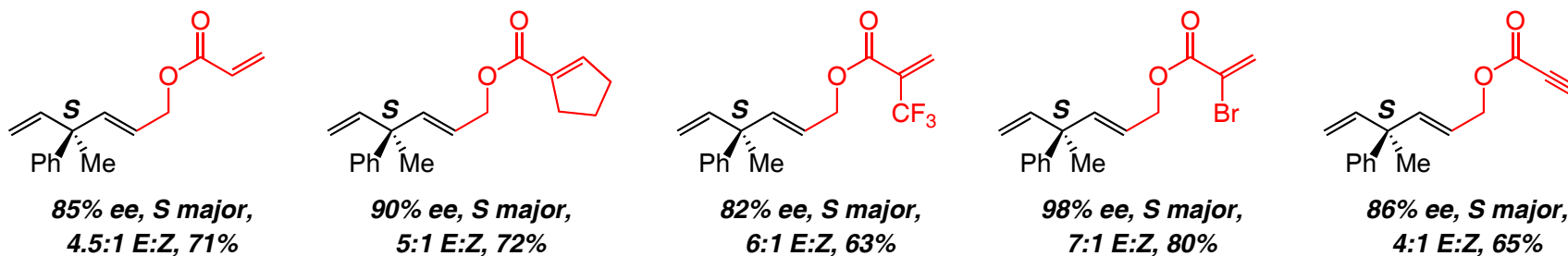


Initial Key Findings:



- <2% RCM of cross partner
low strain release: slow RCM

Other Notable Examples:



with Giudici *JACS* **2007**, 3824