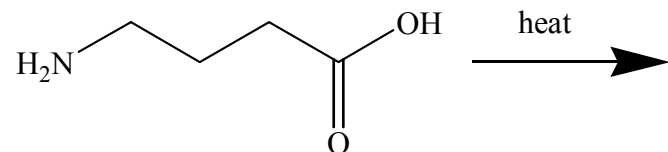


Chem. 571- Problem Set 2- 2005-03-24

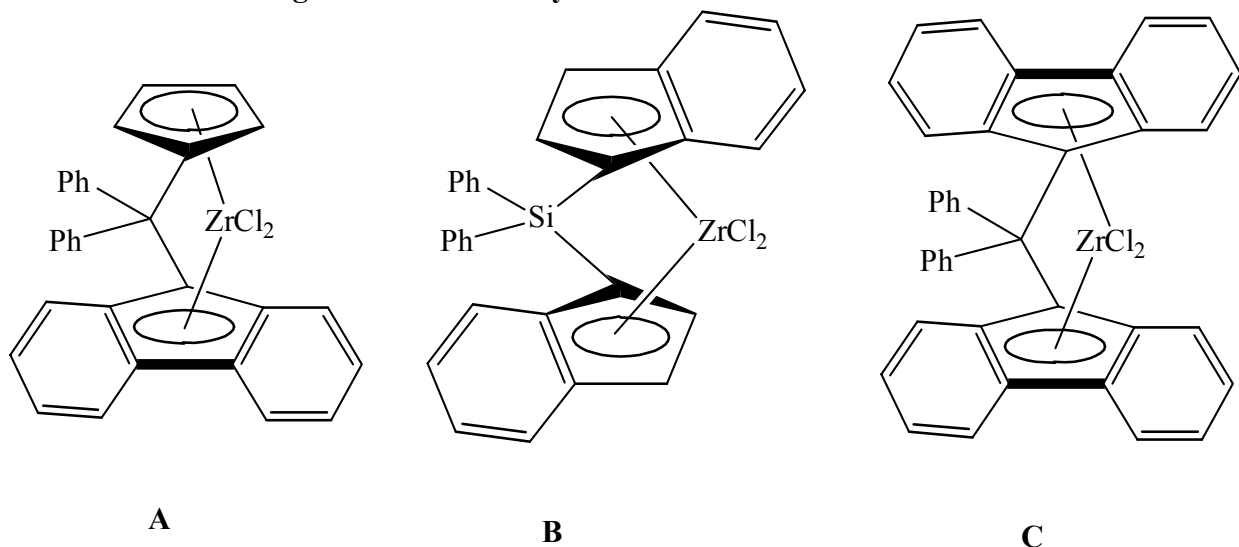
1.

a. Show the structure of the polymer which might be expected by heating 4-aminobutanoic acid.



b. When this reaction is carried out, no polymer is obtained. What forms instead, and why?

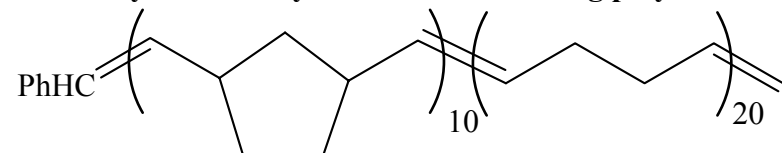
2. Given the following metallocene catalysts:



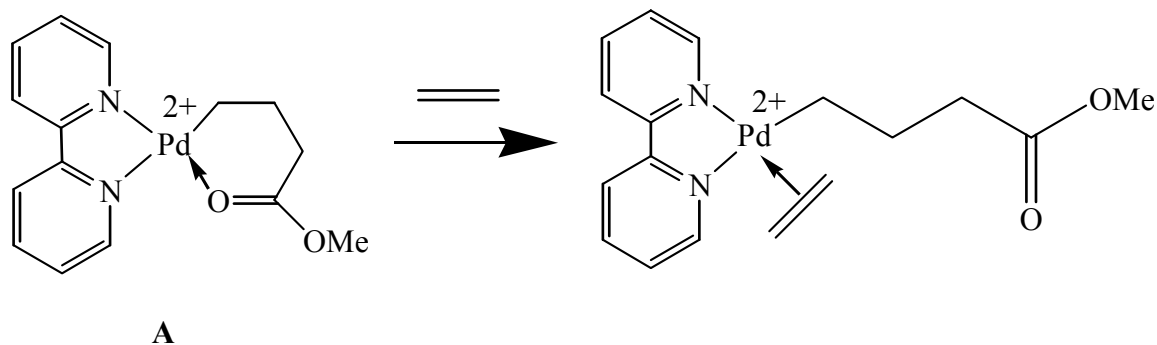
a. What is the stereochemistry of polypropylene obtained by treatment of each of A, B or C with propylene and MAO? Explain with a mechanism.

b. Which of the three catalysts would give polypropylene with the following octad : “mmmrmmm” ?

3. How you would synthesize the following polymer?

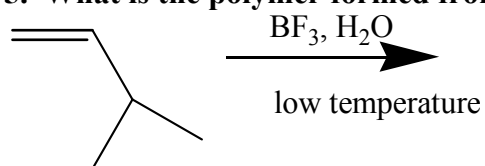


4. Given the following reaction:

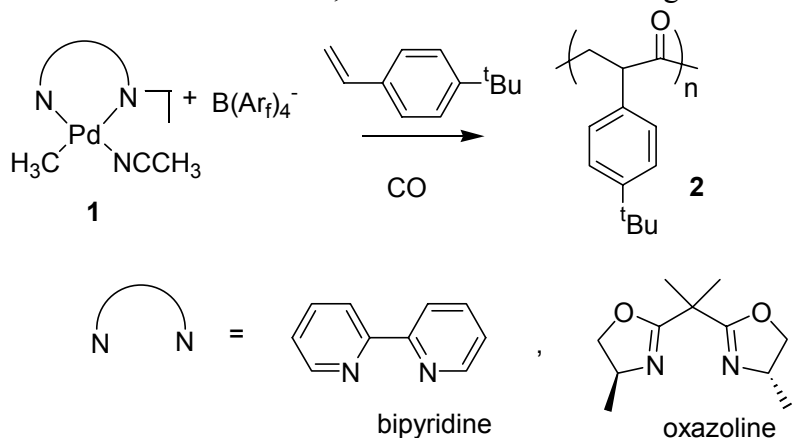


- a. What is the mechanism of polymerization of ethylene using catalyst A?
- b. Why does the molecular weight distribution of the polymer broaden when a low pressure of ethylene is used?

5. What is the polymer formed from the following reaction?



6. The following complex can catalyze the polymerization of alkene and CO by alternating insertion of the two monomers, as shown in the following scheme:



Explain the following observations:

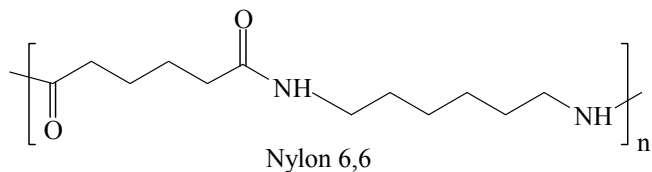
- (a) when this polymerization is carried out using catalyst **1** with bipyridine as the attached ligand, the obtained polymer **2** is syndiotactic.
- (b) when this polymerization is carried out using catalyst **1** with oxazoline (chiral molecule) as the attached ligand, the obtained polymer **2** is isotactic. Which of the following octads corresponds to this polymer: *mmrrmm* or *mmmrmm*?
- (c) when this polymerization is carried out first using catalyst **1** with oxazoline as the attached ligand, and then followed by the addition of the ligand bipyridine to the mixture,

the obtained polymer **2** is a stereoblock copolymer containing both isotactic and syndiotactic blocks.

7. Show how you would prepare the following polymers:

a. Linear polyethylene (industrially)

b. Fibers of Nylon 6,6



c. Polyethylene terephthalate