

Part 1. Problems in the textbook

Do Problem 1.1 and 1.3.

Do Problem 2.3. (typo in the structure of EGDMA)

Do Problem 3.1, 3.2, 3.4, 3.5, 3.7, and 3.8.

Do Problem 4.1, 4.2, 4.3, 4.4, 4.5, and 4.9.

The answers to the problems are on pp645-646.

Part 2. Last year's Exam #1

- You are given two polymer samples, and informed that they are PMMA and PET.
 - Draw the repeat unit structure of them.
 - Can you tell whether a polymer is a step or a chain polymer from its repeat unit structure? Explain how and why with your answer to (a) above.
 - How would you determine whether a polymer sample is crosslinked or not? Describe your experiment.
- A polyamide is synthesized with $\text{H}_2\text{N}-(\text{CH}_2)_4-\text{COOH}$.
 - What would be the mole fraction of dimer at the conversion of 0.98?
 - If any external catalyst were not used, what would be the ratio of the reaction time for the conversion of 0.99 to the reaction time for the conversion of 0.98?
 - What would be the weight-average molar mass of this polymer at the conversion of 0.98?
 - What would be the number-average molar mass if the polymerization proceeded with 1 mole % of ethyl amine, assuming the conversion of 1.0?
- For the radical polymerization of vinyl chloride ($\text{CH}_2=\text{CHCl}$), answer the following questions.
 - Write the chemical equations for the two termination reactions.
 - Write the chemical equation for chain transfer to monomer.
 - Which of the two termination modes is more favored at a lower polymerization temperature? Explain why.
 - Which of the two termination modes is more popular for PVC compared to PMMA? Explain why.
- LDPE is produced by radical polymerization of ethylene at high temperature and pressure.
 - Why do you need high pressure? Discuss in terms of monomer structure.
 - LDPE has short branches (about 20-30 branches/1000 carbons). What mechanism causes the branches?
 - Show by drawing how ethyl and butyl branches are formed.
- Answer the following questions briefly.
 - Discuss the advantages and disadvantages of hyperbranched polymer compared to dendrimer.
 - Gel point in multifunctional step polymerization can be predicted by two approaches. One predicts earlier and the other later than actual. Explain the reasons for the under- and overestimation.
 - Rate of polymerization and molar mass can be controlled concurrently in emulsion polymerization, while it is not possible in ordinary radical polymerization. Explain why by comparing how the rate is controlled in the two polymerization processes.
- Explain the followings in your own word, preferably in one sentence.
 - starburst limit
 - autoacceleration
 - autoinhibition