

# Polymer chemistry and macromolecular engineering

## Fall 2024

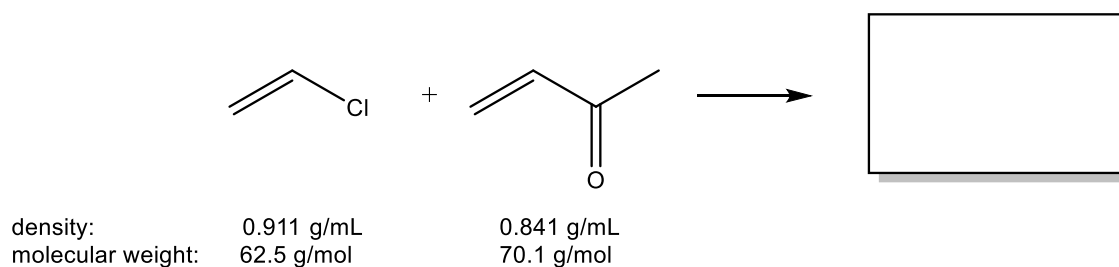
### Assignment 5

1. Consider the following monomer reactivity ratios for the copolymerization of several different pairs of monomers:

| Case | $r_1$ | $r_2$ |
|------|-------|-------|
| 1    | 0.1   | 0.2   |
| 2    | 0.1   | 10    |
| 3    | 0.1   | 3     |
| 4    | 0     | 0.3   |
| 5    | 0     | 0     |
| 6    | 0.8   | 2     |
| 7    | 1     | 15    |

What is the composition of the copolymer that would be formed at low conversion from equimolar mixtures of the two monomers in each case? What can you say about the microstructure of the copolymers that are formed?

2. Two equivalent volumes of methyl vinyl ketone and vinyl chloride are polymerized via free radical chain polymerization at 70 °C.



- Draw the structure of the copolymer.
- What is the mole fraction of methyl vinyl ketone and vinyl chloride in the copolymer given that their reactivity ratios are 8.3 and 0.1, respectively, under a steady-state assumption?
- Which type of copolymer is obtained from the copolymerization of these two monomers?
- How could a random copolymer, which contains equimolar quantities of the two monomers be obtained? Explain.

3. Draw plots of the initial composition of copolymers prepared via radical polymerization for the following sets of co-monomer. What type of copolymers are these?
- a) Acrylonitrile ( $r_1 = 1.5$ ) and methyl acrylate ( $r_2 = 0.84$ ):
  - b) Acrylonitrile ( $r_1 = 0.02$ ) and styrene ( $r_2 = 0.29$ ):