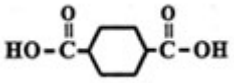
Session #29: Homework Solutions

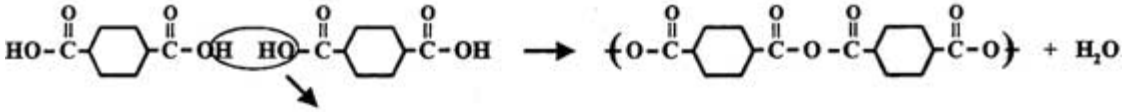
Problem #1

Show how the following monomer can be polymerized. What type of polymerization is used?



Solution

Condensation polymerization

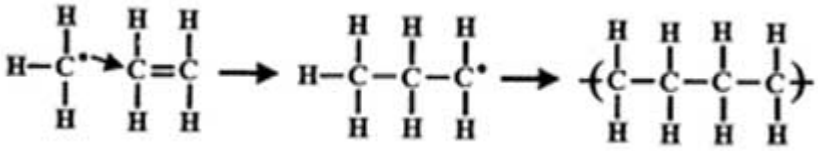


Problem #2

Show how $H_2C=CH_2$ can be polymerized. What type of polymerization is used?

Solution

Addition polymerization



Problem #3

Why can PE milk jugs be recycled while automobile tires cannot?

Solution

PE has no crosslinks; therefore, all inter-chain bonding is secondary. This means the bonds can be broken by heating the material above the glass transition temperature to form a liquid which can be reformed into another shape. Tires are made of rubber which is cross linked. i.e., covalent bonds forms between chain segments. To break these bonds would require heating to temperatures so high that the backbone of the chain itself would break down resulting in the wholesale degradation of the rubber. Thus rubber tires are not recyclable.

Problem #4

A polymeric ski boot has been designed to be flexible at room temperature but stiff out on the slopes. What is going on at the molecular level to confer this behavior?

Solution

The glass transition temperature of the polymer must lie between room temperature and ~0ºC.

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