

SUMMARY

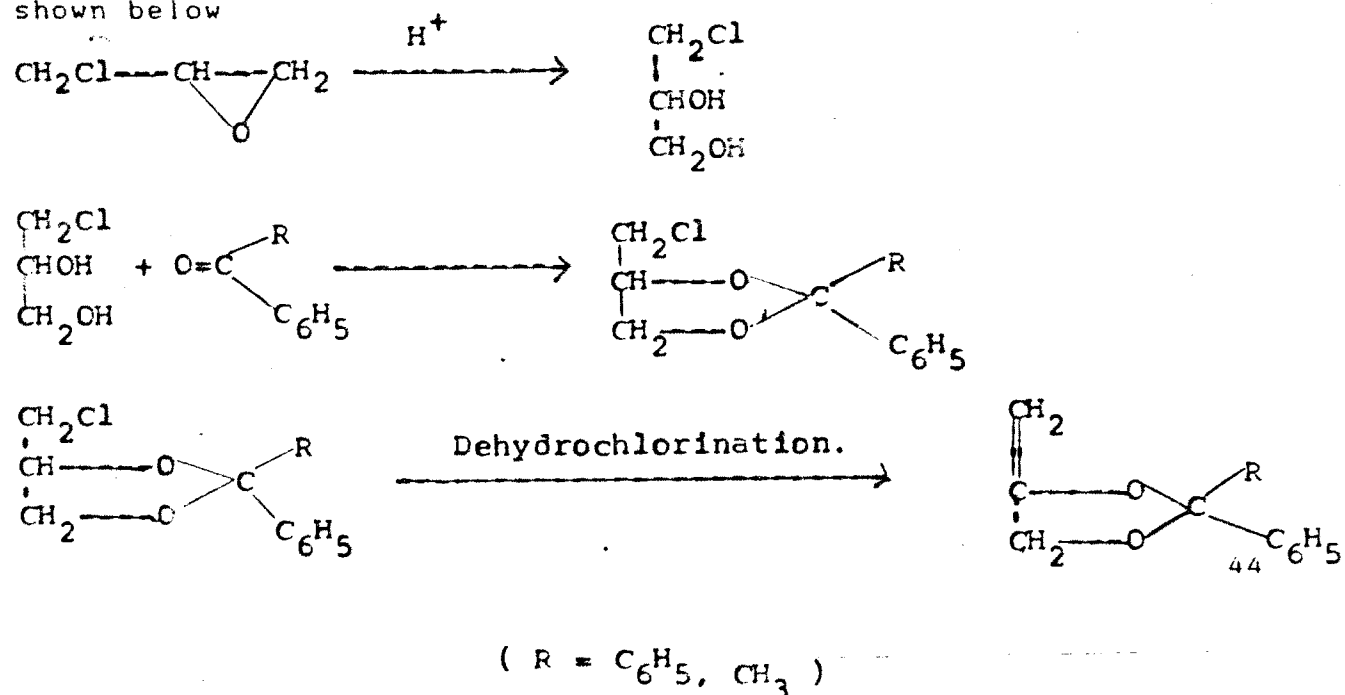
SUMMARY

Although ionic ring opening reactions are frequently encountered in the chemistry of polymers, radical ring opening polymerization reactions are rather rare. 2-methylene-1,3-dioxolane, 2-methylene-1,3-dioxepane and their derivatives are known to undergo radical ring opening polymerization to give polyesters. Thus polyesters can be synthesized using radical mechanism.

In the present study following monomers were synthesized.

- A) 2,2-diphenyl-4-methylene-1,3-dioxolane
- B) 2-methyl-2-phenyl-4-methylene-1,3-dioxolane

The method of synthesis involved reaction of 3-chloro-1,2-propane diol with a ketone (benzophenone and acetophenone) to yield 4-chloromethyl 2 substituted dioxolane, which was dehydrochlorinated to obtain monomers. The synthetic route is as shown below



The monomers were further subjected to electropolymerization using a specially fabricated setup in which reactions at cathode and anode could be studied. Since the monomers synthesized were not electroactive, supporting electrolytes (ammonium chloride, ammonium nitrate) were used to make the solution of monomers electrically conducting. In the case of polymerization of 2-methyl-2-phenyl-4-methylene-1,3-dioxolane with ammonium nitrate as the supporting electrolyte, the polymerization occurred in the anode compartment due to initiation by NO_3 radical formed by oxidation of NO_3^- anion, while polymerization of 2,2-diphenyl-4-methylene-1,3-dioxolane (DMD) occurred in the both cathode as well as anode compartments. Kinetic parameters of the polymerization were calculated. Mechanism for radical ring opening polymerization was similar to that observed in thermal polymerization.

The ratio of hydrogen radicals used up in polymerization to the total hydrogen radical generated during electrolysis is calculated.