CHAPTER - 1
INTRODUCTION
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The increasing use of polymeric material in diversified new areas like in bio-medical applications, in aerospace and high temperature systems, has made it imperative to develop new kinds of polymers either by molecular structural modification or by the use of additives. The development of new monomers and catalyst has made it easier to modify and synthesize new highly stable polymeric material of improved physico-mechanical properties.

Vinyl polymers are being used as coatings, adhesives, plastics and fibres. Copolymerization of vinyl monomers has been found to be an easy and economical method for the development of polymers of unique properties where a wide variety of polymers of different compositions can be produced. The sequencing of monomer units in the copolymer depends on the reactivity, type of the catalyst and additives used during the copolymerization. Copolymer of vinyl monomers are being synthesized by free radical and ionic copolymerization methods. Complex coordination catalysts are also being used for the synthesis of copolymers of highly ordered molecular structure.

The term copolymer includes all those polymeric materials in which two or more monomers are present as their integral parts. The sequencing of the monomer units in the copolymer strongly affects the properties of the copolymer.
These copolymers can be classified as follows on the basis of the sequencing of the monomers in copolymer.

1. Alternate copolymer - where the monomer units are arranged in alternating sequence.

2. Block copolymer - where the monomer units form blocks in the molecular chain.

3. Random copolymer - This type of copolymer has randomly distributed monomer units in the molecular chain.

4. Graft copolymer - It is a branched copolymer in which blocks of monomer are chemically bonded as side chains of varying lengths to the linear backbone of monomer units forming a block.

There has been much interest in the development of alternating copolymer. Several methods have been developed for the preparation of these sequential copolymers and they may be classified into two categories; one is alternating addition of the monomers in copolymerization and the other is the copolymerization via a 1:1 intermediate or a stable monomer complex composed of two monomer units. Studies have been done on the alternating copolymerization by using different kinds of monomers having electron releasing and accepting properties. Lewis acids have been found to increase the electron accepting tendency of the acceptor monomer. Effective
Lewis acids have been defined as metal compounds with a non-transition element metal as central atom for example zinc halide, alkyl aluminium halide, triethyl aluminium, stannic chloride, boron trifluoride etc.

Only few studies have been done on the alternating copolymerization of donor and acceptor monomers in the presence of Lewis acids. In this investigation kinetics of copolymerization of vinyl monomers has been studied. Acrylonitrile-1 styrene and methyl acrylate-1 styrene systems have been taken for these copolymerization studies. Zinc chloride, zinc bromide and boron trifluoride have been used for the complex formation with the donor and acceptor monomers. Parameters such as concentration of Lewis acids, free radical initiators, temperature of copolymerization and time has been varied to get deeper in sight into the kinetics of copolymerization of this binary copolymer system.

Dilatometric method has been used for measuring the contraction in the solution during copolymerization of vinyl monomers. The composition of the copolymer has been studied by n.m.r. and i.r. spectroscopy and elemental analysis. The kinetic data for copolymerization has also been corrected with the reaction mechanism and the molecular structure of the synthesized copolymer.