Chapter I

Introduction

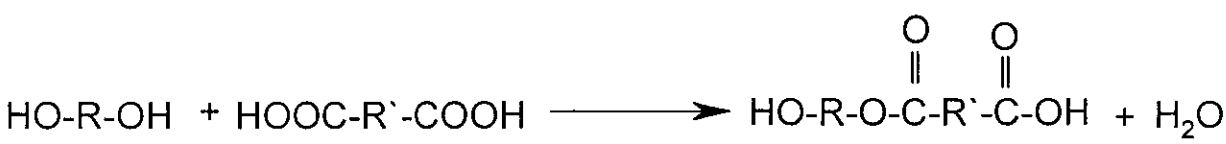
I. INTRODUCTION

I.1. General Introduction:

The world polymer is of Greek origin and means a molecule that consists of many parts and, the units that built up a polymer are called monomers. Natural polymers such as wood, cotton, wool, silk, rubber and many types of gums have been used in all kinds of particular applications. Synthetic polymers were found to have very interesting applications as fibers, plastics rubbers, coatings or adhesives [1-8].

Polymerizations can be generally classified as addition or condensation reactions depending on whether or not a simple molecule was split out during the polymerization. As an example of condensation polymer is the polyester formed from diacid and diol with the elimination of water.

Blencowe classified polymerization into step-growth and chain-growth reactions depending on the mechanism of the growth reaction. Polyesterification is a classical example of a step-growth polymerization. The first step in polyesterification reaction is the reaction of the diol and the diacid monomers to form dimmer as follows:



The dimmer then reacts with itself to form tetramer or with unreacted monomer to yield trimer and any two molecular species in the reaction mixture can react. The monomer is almost all incorporated in a chain molecule in the early stages of the reaction and the chain length increase steadily as the reaction proceeds.

Polymers can be also divided according to their thermal and mechanical properties into three major classes; thermoplastics, thermosets and elastomers.

Thermoplastics, like polyethylene, polystyrene, polymethyl methacrylate, sometimes called engineering plastics are processed in the molten state, their final shape and internal structure established by cooling, and they can be softened and reshaped by reapplication of heat and pressure.

Thermoset polymers, like the epoxies, polyesters and formaldehyde based resins, usually go through three formative stages. In the first stage, the resin is still soluble and fusible. In the second stage, thermosets are nearly insoluble, but are still thermo-plastics. They can however, spend only a relatively short times in the molten state because the temperatures that promote flow also cause the material to crosslink. The cross-linking reaction is accomplished in the final stages of polymerization, the third stage during molding of the product under the controlled influence of heat and pressure overtime. Thus, thermosets build their final structure during processing, formining three dimensional internal structural network