

## CHAPTER I


### INTRODUCTION

Polymerization is very important from the technological view point. It can greatly increase ability of polymer scientist to make polymer products with specifically desired properties and almost unlimited number of products can be produced by varying relative amounts of two monomer units in the copolymer products. Poly(vinyl chloride) (PVC), for example, is an importantly commercial plastic material which can be used in wide range applications from household commodities to industrial materials, such as pipes, film, sheet, cable, paste, profiles, bottles. Because of many outstanding characteristics, almost all kinds of molding methods can be utilized, any colored products, transparent products as well as opaque products can be made. Artificial leather is an important product of PVC. To improve mechanical properties of such product, the copolymer of VCM/VDC was investigated. A number of papers have reported NMR studies of PVC (Johnson, 1961, Dorskocilova, 1964) , poly (vinylidene chloride) (Okuda, 1964), and VCM/VDC copolymers (Kensuke oduda, 1964, Sureh, 1993).

In this study, it is concerned with the synthesis by variation VCM/VDC weight ratio, temperature, amount of catalysts and stirring speed. Characterization of copolymer products by FTIR, NMR, GPC, DSC, particle size analyzer and mechanical property study is investigated, as well.

#### 1.1 Copolymer synthesis

Copolymers can be synthesized using step polymerization, chain polymerization or ionic polymerization. Free radical polymerization is an important mechanism to produce vinyl polymer. The polymer obtained follows



3 major steps. The polymerization must first be initiated by generating an active site on a monomer, then the chains propagate and finally followed by termination. There are some factors affecting free radical polymerization, for example reaction medium, temperature, and pressure which also will affect copolymer properties, as well. There are many methods of converting vinyl chloride monomer to polymer or copolymers, normally bulk, emulsion, or suspension polymerization. The method utilized for this research is the suspension polymerization. A typical charge for this system consists of water, monomer, initiator, suspending agent which can be protective colloid or insoluble inorganic salt. The size of the product beads depends on the strength of agitation, as well as the nature of the monomer and suspending system .

### **1.2 The influence of copolymerization on properties of copolymers**

Because the VCM/VDC copolymers were synthesized via free radical polymerization, they have chance to occur as random copolymers. Copolymerization results in copolymers whose crystalline melting points vary with composition. PVC is an amorphous polymer, it shows variation of  $T_m$  and  $T_g$  when it is copolymerized at various compositions. The properties of copolymers are also resulted from the properties of the comonomer added, the method and condition of copolymerization utilized.