CHAPTER 1

INTRODUCTION

An ultimate objective to blend two or more polymers is to obtain materials having desired specific properties, such as tensile and impact strength, chemical resistance, weatherability, which would be better than those of homopolymers. The physical properties of the polymer blend depend upon the properties of each of the homopolymers used as well as the way that they are combined. Both chemical and physical blendings are possible by which the latter is the blending in the liquid state (either by melting of both homopolymers or by dispersion in a solvent). The former is acheived by reactions of functional groups existing in homopolymers. This type of blending is getting more interesting since it can be employed to produce products with complicated shape using a twin screw extruder. The chemical blending process which chemical reactions occur in situ can be called as "Reactive Blending".

Interpenetrating polymer network (IPN) is a kind of unique polymer blend having been of commercial and academic interest. It consists of

two or more crosslinked polymers held together by interpenetration and entanglement of networks which indicate that there are no covalent bonds between them. If one polymer is crosslinked and the other is linear uncrosslinking, the resulting system is called a semi-IPN.

There are two methods in synthesis IPN including (a) a sequential synthesis and (b) a simultaneous synthesis. The former is successful by swelling of polymer I in the monomer II containing a crosslinking agent, and the mononer II is subsequently polymerized and crosslinked. The latter is acheived by simultaneous polymerization of mononers I and II in the presence of crosslinking agents. Formation of IPN is the only way of intimately combining different types of crosslinked polymers. The resulting polymer exhibit a limited phase separation. While a normal polymer blend usually shows a multiphase morphology due to the lack of suitable bonding forces between the two polymer phases. In effect IPN have better mechanical properties than the normal polymer blends.

IPN based on polyurethane (PU) is of very much interest in particular PU with epoxy, PU with unsaturated polyester, PU with poly (methyl methacrylate), to mention but a few. In the present work, semi-

IPN based on crosslinked PU matrix and poly(vinyl chloride) (PVC) dispersed phase is synthesized. The PU soft segment was derived from the reaction of modified methylene(bis)diphenyl diisocyanate (MMDI) with α,ω-hydroxyl polycaprolactone or polycaprolactone glycol (PCL). The hard segment was formed from the reaction of MMDI with triethanolamine (TEA). There is no phase separation between the PU matrix and the dispersed PVC. This semi-IPN have been reported to be possible to use as the instrument panel in automobile instead of PVC padded or PU padded with PVC skinned, because of its superior flexibility and stiffness. In addition IPNs would be less costly than one moulds a conventional modified engineering resin or blend.

In the present work, the semi-IPNs of PU with PVC were prepared by variation of percentage of PVC and of methods of preparation. Their mechanical properties, including hardness, tensile strength, elongation at break, and physical properties, including glass transition temperature (T_g), as a function of variations of the equivalent ratio of isocyanate to polyol (the NCO/OH ratio) in PU, weight composition between PU and PVC for particular preparation methods were measured.