CHAPTER 3
LITERATURE REVIEW

Nierzwichi and Wysocka (1980) studied examinations of polyurethane elastomers of varying amount of chemical crosslinking revealed a joint action of crosslinking and microphase separation in determining mechanical properties of the systems. Together with swelling behavior and glass transition temperature of examinations. Polyurethanes were prepared from poly (ethylene adipate) glycol, 1,4-butanediol, or 3,3′-dichloro-4,4′-diaminodiphenylmethane, 4,4′-diphenyl methane diisocyanate.

This work summarized that mechanical properties of urethane are influenced directly to NCO/OH ratio and the excess of isocyanate groups is able to take part in crosslinking reaction through formation of allophanate or biuret linkages.

Ilavsky and Dusek (1983) studied the equilibrium mechanical and optical behaviour of networks prepared from poly(oxypropylene)triols and 4,4′-diphenyl methane diisocyanate (MDI) at various initial molar ratios of reactive groups, r_H = [OH] / [NCO], in the range $0.6 < r_H < 1.75$ and studied comparison between experimental and theoretical dependences of the equilibrium mechanical.

The results of this work were concluded that in the range $r_H \geq 1$ the theory adequately describes experimental depencences, while in the range $r_H < 1$ excess crosslinking takes place, obviously due to the formation of allophanate groups.

Deanin, Muraaka and Kapasi (1985) stuied the effect of variation of polyol functional groups, polyol molecular weight and NCO/OH equivalent ratio. Polyurethanes were prepared from isocyanate 125-M MDI, three polyester polyols of MW 1000, 2000 and 3000 or three polyether polyols of MW 650, 1000 and 2000, toluene, 1,4-butanediol, Poly(dimethyl siloxane).

The results of this work were concluded that increasing NCO/OH ratio also increased hardness, tensile modulus, ultimate tensile strength, tear strength, ultimate elongation and rebond. Polyether gave higher hardness, tensile modulus, ultimate

tensile strength, tear strength and rebond than polyester which gave higher ultimate elongation. Lower-molecular-weight polyol gave higher hardness, tensile modulus, ultimate tensile strength and tear strength. On the other hand, higher-molecular-weight gave higher ultimate elongation and rebond.

Petrovic and Simendic (1985) studied the effect of variation of three series of segmented polyurethanes based on diphenylmethane diisocyanate, 1,4-butanediol and three polytetramethylene oxide diol of Mn = 650, 1000 and 2000 on mechanical, thermochemical and dynamic mechanical properties. It was shown that maximum tensile strength obtained when soft segment concentration (concentration of polytetramethylene oxide diol) was 40-50%, at a fixed NCO:OH ratio at 1:1, which was explained by a specific interlocking morphology. Thus elongation at break increases linearly with polytetramethylene oxide diol concentration. On the other hand, hardness, modulus, and tear strength are mainly affected by hard segment concentration (diphenylmethane diisocyanate and 1,4-butanediol).

Harris et al (1990) studied the effect of variation of isocyanate index in chemical composition of 4,4′-methylene-di(phenylisocyanate) and 1,4-butanediol on properties which had constant quantity of poly(ethylene ether carbonate) diol. While the concentration of 4,4′-methylene-di(phenylisocyanate) and 1,4-butanediol were increased, the properties sush as solvent resistance, melting point, hardness, tensile strength were improved.

Maneerattanaroongruang (1994) studied a low cost paving surface of polyurethane by using brick powder as filler. Unfilled Polyurethanes were prepared by polyester polyol, polymeric MDI, 1,4-butanediol. The results of this work were concluded that the suitable compositions for paving surface was found to be 10 weight percentage of brick powder which passed through a US sieve No. 325.

Buchhiktz, Rambosek and Drew (US. Pat. No. 3,272,098) investigated the preparation of tough resilient paving surface from polyurethane by continuous process. This polyurethane was producted by organic polyol and organic isocyanate in amounts providing an approximately equivalent number of NCO/OH groups and incorporated resilient aggregate. The size of resilient aggregate in the range of 1/16 inch to 1/3 inch which using about 10% to 50% by volume. The advancetage of resilient aggregate for paving surface was good non-slip characteristic and simple to repair.

Verdol and Ryan (US. Pat. No. 3,427,366) improved the properties such as improved hydrocarbon oils and solvent resistance, increased abrasion resistance, and high tensile strength of polyurethane by using rubber composition. It contained hydrocarbon rubber and urethane resin. The urethane polymer is produced by reaction of a diisocyanate with an intermediate polyhydroxy polymer having a viscoscity at 30 °C about 5-20,000 poise number average molecular weight of about 400-25,000.

Coke and Gill (US.Pat.No. 4,614,686) studied preparation a running track of polyurethane elastomer with dipersed granular particles through out the polyurethane. The size of particles was 0.0625-0.125 inch and constitute 26-30 weight prcentage of the granular rubber (stylene-butadiene-rubber or natural rubber) to provide a roughened traction surface. Average track thickness was preferred 0.38-0.5 inch and there are two layers of encapsulted rubber particles and a layer of encapsulted polyurethane elastomer particles.