

Polyurethane Ionomers Architecture

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A polyurethane(PU) ionomer can be defined as a copolymer consisting of a PU backbone with a minority of the repeat units carrying pendant acid or tertiary nitrogen groups which are completely or partially neutralized or quaternized to form salts[1]. The presence of ionic species in PU ionomers has a considerable effect on physical properties[2], and it is reasonable to suppose that the interactions between ions and their counterions are responsible for these effects[3-5]. PU ionomers are of considerable scientific and commercial interests due to their unique structures and the fact that they could be utilized in the form of water dispersions for coatings and adhesives[6].

Like solventborne PU, physical properties of PU ionomers are determined by a number of factors, such as size and crystallinity of each domain, and the degree of phase mixing, in addition to the ionic content. Factors influencing the phase separation include segmental polarity difference, segmental length, crystallizability of either segment, intra- and intersegment interactions such as hydrogen bonding, overall composition, and molecular weight.

This study describes the synthesis and properties of PU ionomers. Four types polyol, i. e., PTAd(polytetramethylene adipate glycol), PCL(polycaprolactone glycol), PTMG(polytetramethylene glycol), and PPG(polypropylene glycol), and three types of isocyanate, i. e., MDI(4, 4'-diphenylmethane diisocyanate), HDI(hexamethylene

diisocyanate), and IPDI(isophoron diisocyanate) were used. With dimethylol propionic acid(DMPA) as potential ionic center, the effects of extender content, degree of neutralization, and Mn of polyol in addition to the soft and hard segment structure on the physical properties of PU ionomers were systematically investigated.

Table. Effect of Diisocyanate Type on the Tensile Properties of PU Ionomers from PTA_d(M_n=1000)

Diisocyanate	Mn	<u>Before Neutralization</u>		<u>After Neutralization</u>	
		σ_b (kg/cm ²)	ϵ_b (%)	σ_b (kg/cm ²)	ϵ_b (%)
MDI	250	203	713	263	312
HDI	168	154	832	196	516
IPDI	223	137	756	180	448

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