

Thesis Title Anionic Polymerization of Diblock Poly(isoprene-b-styrene) and Poly(isoprene-b-methyl methacrylate)

Name Sureemas Pasiri

Degree Master of Science (Polymer Science)

Thesis Supervisory Committee

Pranee Phinyocheep, Doctorat de l'Universite' du Maine

Prapin Wilairat, Ph.D.

Anucha Euapermkhati, Ph.D.

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ABSTRACT

In this study, polyisoprene (PI), polystyrene (PS) and poly(methyl methacrylate) (PMMA) were first synthesized using the anionic polymerization reaction. *n*-BuLi was used as an initiator and toluene as solvent. Polyisoprenes prepared at 40°C with different polymerization time were consisted of 92% and 8% of 1,4- and 3,4-isomer, respectively, as determined by ¹H-NMR spectroscopic technique. ¹³C-NMR spectroscopy were employed to evaluate number of cis-1,4- and trans-1,4-isomers to be 80% and 14%. Polystyrene could be prepared using the same condition as for polyisoprene. Poly(methyl methacrylate) could also be synthesized via anionic polymerization at -78°C. Since methyl methacrylate monomer contains ester side chain, shorter polymerization time approximately 10 minutes was necessary to avoid the side reactions. Glass transition temperature (*T_g*) of synthesized PMMA was close to that of commercial isotactic PMMA. An attempt was also made on preparation of hydroxyl-terminated polyisoprene using the anionic

polymerization. Benzophenone and propylene oxide were employed as terminating agents. They exhibited the characteristic peaks in IR, ^1H -NMR and ^{13}C -NMR spectra as same as those of polyisoprene. However, the hydroxyl group characteristic peak was not detected.

Poly(isoprene-*b*-styrene) were synthesized using the sequential addition anionic polymerization using the same conditions as those used for the preparation of each homopolymer. Poly(isoprene-*b*-methyl methacrylate) were also synthesized via the sequential anionic polymerization using 1,1-diphenylethylene (DPE) as an end-capping agent. The obtained diblock copolymers were purified to remove the unexpected homopolymers. The block copolymer containing PMMA-block polymerized at 10 min gives better results. Thermal behaviour of the block copolymer was also investigated, such as glass transition temperature of the block copolymers.

Molecular weight (MW) and molecular weight distribution (MWD) of the synthesized polymers were also determined using Gel Permeation Chromatography (GPC). It was found that MWD were fairly narrow. Except for the block copolymers containing PMMA block, which their MWD showed the broad distribution.