

One pot synthesis of high-molecule-weight polyetherimides and their copolymers from bis(chlorophthalimide) and dichlorodiphenylsulfone using diphenylsulfone as the solvent

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Keywords: polyetherimide copolymers one-pot synthesis in diphenylsulfone structure-property relations

Polyetherimides which include additional ether functions, as the most important modified polyimides, have been receiving great attention as they may provide good processability owing to the presence of flexible ether links. GE's Ultem® and the Avimid® series which was pioneered by Du Pont are the most successful examples. Ultem® can be synthesized via the two-step method using dianhydrides and diamines, or by the nucleophilic displacement of bisphenolate and bis chloro- or nitro phthalimides. The latter is more favorable because of its lower cost. However, it is difficult to get high-molecule-weight polymers because of the unstability of bisphthalimide in alkaline conditions. This reaction is usually carried out in aprotic solvents such as DMAc, DMSO, and NMP. However, it is difficult to get high-molecule-weight polymers because of the unstability of bisphthalimide in alkaline conditions. In this article, we synthesized poly(ether-imide-co-ether-sulfone) using diphenylsulfone as the solvent. Because of the immiscibility of diphenylsulfone with water, it is easy to get high-molecule-weight polymers. The properties of copolymers are also presented.

High-molecule-weight polyetherimides and their copolymers have been synthesized in one pot from bis(chlorophthalimide), dichlorodiphenylsulfone and bisphenolate, which is contributed to using diphenylsulfone as the solvent. The inherent viscosities of polymers are range from 0.32 to 0.72 dl/g and their structures were confirmed by IR and elemental analyses. All of polymers have good solubility in common organic solvents. The 5% weight-loss temperatures of isomeric polyimides were 429-507⁰C in air. The glass-transition temperatures (T_g) of 4, 4'-(9-fluorenylidene) diphenol-based polymers are in the range of 204-268⁰C, and the T_g s increase as the ratios of diphenylsulfone increase. The glass-transition temperatures (T_g) of bisphenol A-based polymers are in the range of 198-204⁰C, while the T_g s unconspicuously change when the ratios of diphenylsulfone increase. Either 4, 4'-(9-fluorenylidene) diphenol or biphenol A is used, the mechanical properties of copolymers are the best when the ratio of diphenylsulfone is 20%. The wide-angle X-ray diffraction showed that all polymers are amorphous. The crystalline tendency of polyethersulfone is depressed by copolymerization with polyetherimide.