(13) Development of High performance Polyimides

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Introduction

Recently, polymers with pendant sodium sulfonate groups attract interests in fuel cell and sensor technology. Many studies have been done for sulfonated aromatic polyethers, but not for sulfonated polyimides. The objectives of this study are to synthesize sulfonated polyimides and hyperbranced aromatic polymers. The latter has potential applications for optoelectronics and membrane separations and so on.

Experimental, results and discussion

Copolyimides from 2,5-diamino benzenesulfonic acid were prepared by an usual two-step method, but their molecular weight was not high enough due to lower reactivity. Then, we tried to synthesize a more reactive diamine with sulfonate groups at meta-positions toward amino groups by coupling and rearrangement of 3-nitrobenzenesulfonic acid, but could not succeed in it. The further experiments are under progress.

Hyperbranched polyamide and polyimide were successfully prepared from AB_2 type monomer, 3, 5-diaminobenzoic acid, and A_2B_3 type comonomers, 2,2-bis (3,4-dicarboxypheny) -hexafluoropropane dianhydride (6FDA) and tris (4-aminophenyl) amine (TAPA) , respectively. These hyperbranched polymers cannot be cast into films due to their globular structure. However, films tough enough for gas permeation measurements were successfully prepared by cast the polymer solution in the presence of crosslinking agents such as ethylene glycol diglycidyl ether. The gas permeation properties of these hyperbranched polymer membranes were investigated. Crosslinking agents and their contents greatly affect the gas permeation. 6FDA-TAPA hyperbranched polyimide membrane crosslinked with terephthaldehyde displayed fairly good separation performance for CO_2/N_2 gas separation. These hyperbranched polymers can be easily chemically modified by the reaction of the amino groups with another functional groups, and have potential application as optoelectronics materials.

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