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Synthesis and Characterization of Novel Aromatic Polyimides from Bis(4-amino-2-biphenyl) ether and Aromatic Tetracarboxylic Dianhydrides

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Aromatic polyimides are characterized by high glass transition temperature (Tg) along with high decomposition temperature and good mechanical properties, and are used in various fields including aerospace and electronic industries. Thereby, the relationships between structures and properties of plolyimides have been extensively investigated, and those of polyimides, derived from 4,4'-oxydianiline (ODA) and various dianhydrides, have been most extensively reported. The ODA-based polyimides are known to possess high Tg and excellent mechanical properties in spite of the rotational flexibility at the diphenyl ether units in the polyimides backbone. Such the flexible units are thought to enhance chain mobility and decrease Tg. One method to prevent the internal rotation at the diphenyl ether units is expected to be the introduction of bulky substituents into the 2- and 2'- positions of the diphenyl ether moiety. The rotational flexibility at the diphenyl ether units is expected to be decreased due to the steric effect between the substituents.

In this study, a new diamine monomer, bis(4-amino-2-phenylphenyl) ether, which had phenyl groups at the 2- and 2'- positions of the diphenyl ether moiety, was synthesized, and aromatic polyimides were derived from it. The properties of polyimides, especially thermal properties, thermal mechanical properties and solubility, were discussed, and the solubility of ODA based polyimides was improved by introducing phenyl groups at 2,2'-position of the phenyl ether without decreasing the thermal and thermo-mechanical properties.