

Synthesis and Properties of Polyimides Derived from Isomeric Diphenylsulfonetetracarboxylic Dianhydrides

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Abstract:

2,2',3,3'-Diphenylsulfonetetracarboxylic dianhydride (3,3'-DSDA), 2,3,3',4'-diphenylsulfonetetracarboxylic dianhydride (3,4'-DSDA) and 3,3',4,4'-diphenylsulfonetetracarboxylic dianhydride (4,4'-DSDA) were synthesized and their structures were confirmed via elemental analysis, FT-IR and ¹H NMR spectroscopy. Poly(amic acid)s derived from the three DSDA isomers with 4,4'-oxydianiline (ODA), 4,4'-bis(4-aminophenoxy)benzene (TPEQ) and 2,2'-bis[4-(4-aminophenoxy)phenyl]propane (BAPP) had inherent viscosities of 0.84-1.22 dL/g and were thermally converted into polyimide films by the conventional thermal imidization method. Among them, the polyimide films derived from 4,4'-DSDA with the three kinds of diamines were flexible and tough, whereas, polyimide films derived from 3,3'-DSDA and 3,4'-DSDA with the short chain diamine of ODA were brittle. It was found that the 3,4'-DSDA based polyimides had better solubility than 3,3'-DSDA and 4,4'-DSDA based polyimides. Moreover, for a given diamine, the *T*_gs of the polyimides based on the three DSDA isomers decreased in the order of 3,3'-DSDA > 3,4'-DSDA > 4,4'-DSDA. The 5% weight loss temperatures of all the polyimide films were around 460 °C and two obvious degradation stages were observed from their DTG curves under nitrogen atmosphere. Furthermore, all the obtained polyimide films were amorphous.