Synthesis and Characterization of fluorenyl Cardo Poyamide-imide

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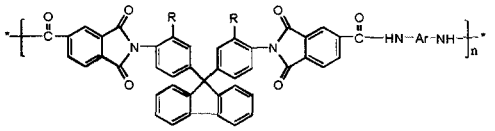
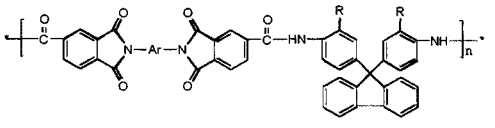
The introduction of "Cardo" groups into the backbone of polymers is an effective approach for improving solubility and thereby processability of polyimides. However, according to our previous study[**1**], the cardo polyimide contains a rigid bulky bisphenylfluorene moiety and causes usually the film to be brittle. Poly(amide–imide)s (PAIs), as a family, have deserved particular attention as they are probably the class of copolyimides that most closely resemble the thermal properties of aromatic polyimides. Furthermore, the inclusion of an amide group into the polyimide backbone increases its processability, solubility, and moldability, but thermal property was slightly decreased. Liaw and Yang [**2,3**]have done many eximious works about soluble polyamide-imides by the direct polycondensation of diimide–dicarboxylic acid and various in *N*-methyl-2-pyrrolidinone (NMP) using triphenyl phosphite as condensing agents.

In the present study, A series of fluorenyl Cardo Polyamide-imides(PAIs) were synthesized by one-pot polycondensation of Cardo diamines, trimellitic anhydride and various aromatic diamines



Head to head structure



Tail to tail structure

R=H(I), CH_3(II) Ar=a-f

p-phenylenediamine, m-phenylenediamine, 4,4'-oxydianiline, 3,4'-oxydianiline, 2,2-bis[4-(4-amino phenoxy)phenyl]propane, 2,2-bis[4-(3-aminophenoxy) phenyl]propane (a-f) using triphenyl phosphite as condensing agents. Most of the polymers were readily soluble in aprotic polar solvents such as including *N*-methyl-2-pyrrolidinone(NMP), *N,N*-dimethylacet- amide(DMAc), and *N,N*-dimethylformamide(DMF), as well as in less polar solvents such as dimethyl sulfoxide (DMSO), pyridine, and tetrahydrofuran etc. Polyamide-imides exhibited better solubility when alkyl substituents were incorporated. Inherent viscosities of these polyamide-imides in DMAc ranged from 0.44 to 0.88 dL/g. The glass transition temperatures of PAIs were in the range of 235–448°C by DSC and 5% weight loss temperature of all polymers exceed 400°C in air.

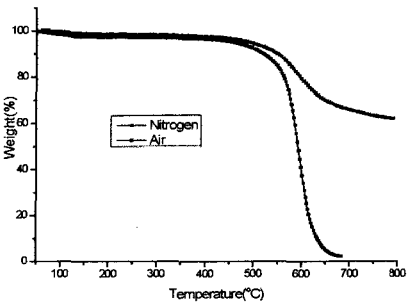


Fig. TGA curves of polymer under Air and nitrogen atmosphere

The polymer films were flexible and had a tensile strength in the range of 64–111 MPa, an elongation at break in the range of 2.2–7.1%.

Keywords: Cardo; Fluorenyl polyamide-imide; solubility; properties

References

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