Syntheses and Properties of Aromatic Polyimides

Y.M.Ahn, T.W.Son*, S.I.Hong**

Dept. of Clothing and Textiles, Hansung Univ.

* Fiber Science Laboratory, KIST

** Dept. of Textile Eng.,Seoul National Univ.

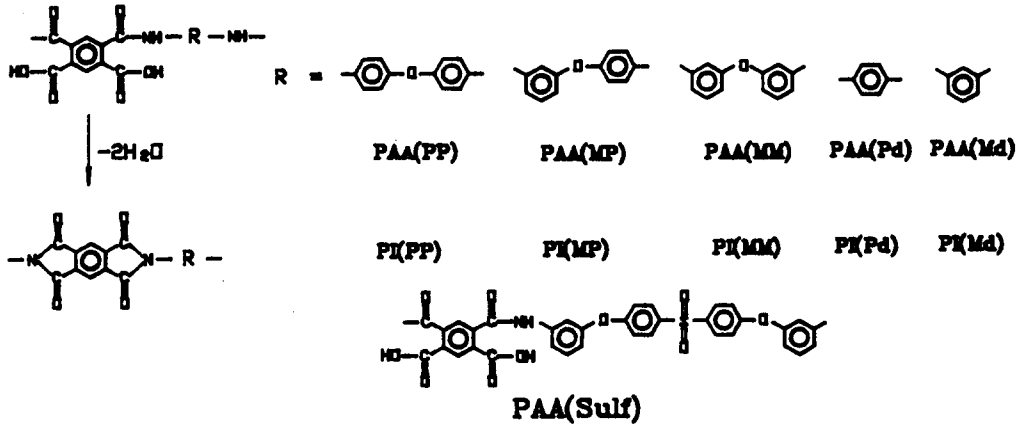
A series of thermosetting poly(pyromellitimide)s were prepared in two steps. Pyromellitic dianhydride was added to the solutions of aromatic diamines in DMF. 3,3'-Diaminodiphenyl ether, 3,4'-diaminodiphenyl ether, 4,4'-diaminodiphenyl ether, p-phenylene diamine, and m-phenylene diamine were chosen as aromatic diamines. When the synthesized poly(pyromellitamic acid)s were dissolved in DMF solvent and stood for a long time, the polymers were hydrolyzed and their hydrolyses were accelerated as the solution concentrations were more dilute. Also, when water was added thereto, the degradation rates were accelerated. The prepolymers were converted to insoluble polyimides by heating. The solubility and the thermal stability of the resulting poly(pyromellitimide)s was investigated. The activation energies of thermal degradation of these polymers were found to be from 38 to 67 Kcal/mol.

On the other hand, three poly(ether-amic acid)s were prepared by low-temperature solution polymerization of 3,3',4,4'-benzophenone tetracarboxylic dianhydride with 4,4'-bis(m-aminophenoxy)benzophenone,

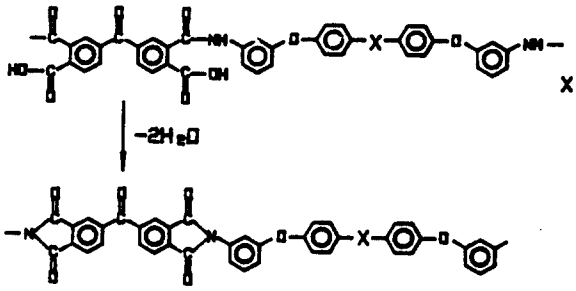
2,2-bis[4-(m-aminophenoxy)phenyl]propane and 4,4'-bis(m-aminophenoxy) biphenyl sulfone, respectively. Three poly(ether-amide-amic acide)s were synthesized from trimellitic anhydride chloride with the same diamines as for poly(ether-amic acid)s, respectively. The above six prepolymers were chemically cyclodehydrated by adding acetic anhydride and pyridine cosolvent in polymer dope. All resulting thermoplastic poly(ether-imide)s and poly(ether-amide-imide)s showed good solubility in pyridine as well as in organic polar solvents such as DMAC and NMP. In addition, they showed not only good thermal stability(Td > 500℃) but also glass transition temperatures(~200℃) suitable for extrusion or injection molding.

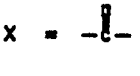
Synthesized Aromatic Polyimides

1. **Poly(pyromellitimide)s**



2. Poly(ether–imide)s

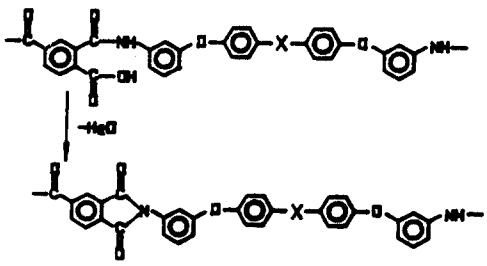


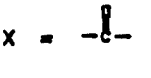
X =   

PEAA(BzPh) PEAA(BisA) PEAA(Sulf)

PEI(BzPh) PEI(BisA) PEI(Sulf)

3. Poly(ether–amide–imide)s



X =   

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