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Synthesis and Characterization of Soluble Polyimide as Membrane material

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Polyimides are one of the most important classes of high-performance polymers. Due to their excellent electriccal, thermal, and high-temperature mechanical properties. The polyimide and its derivatives have found many applications. But their uses are limited by their poor solubilities. In fact, most polyimides were processed in the form of their precursors, polyamic acid, which were subsequently converted to the imide structure.

Polyimides have been modified by incorporating various functional moieties into the polymer backbone. In this way, perhaps most important factor is the separation of the imide structure, which may have the effect of diluting the high associative force of imide ring.

The object of this investigation is to characterization and synthesis of soluble polyimide by general two-step polymerization. The polyimide was prepared by the reaction of aromatic diamhydride and diamine with flexible linkages.

Table. Solubility of Polyimide in the Organic Solvents

| Solvent | Solubility parameter index | Hydrogen bonding index | Solubility |
|---------------|----------------------------|------------------------|------------|
| Acetone | 9.62 | 5.7 | I |
| Acetonitrile | 12.11 | 4.5 | I |
| Acrylonitrile | 10.56 | 4.3 | I |
| Benzene | 9.16 | 2.2 | I |
| Chlorobenzene | 9.67 | 2.7 | I |
| Chloroform | 9.16 | 2.2 | swell |
| Cyclohexane | 8.19 | 2.2 | I |
| Cyclohexanone | 10.42 | 6.4 | I |
| DMAc | 11.10 | 5.0 | S |
| DMF | 11.79 | 6.4 | S |
| DMSo | 13.00 | 5.0 | S |
| Dioxane | 10.13 | 5.7 | swell |
| Ethanol | 12.60 | 9.4 | I |
| Ethyl acetate | 8.80 | 3.5 | I |
| Ethyl ether | 7.70 | 2.5 | I |
| Formamide | 17.79 | 9.3 | I |
| Methanol | 14.50 | 10.9 | I |
| NMP | 11.20 | 3.5 | S |
| i-Propanol | 11.50 | 8.0 | I |
| n-Propanol | 12.00 | 8.5 | I |
| Pyridine | 10.60 | 2.9 | I |
| m-Cresol | | | S |

S : Soluble
I : Insoluble