The Synthesis and Characteristic of A New Soluble Polyimides

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The new soluble polyimides were synthesized from various aromatic dianhydrides and 3,3'-dimethyl-4,4'-diamino-5,5'-diethyldiphenylmethane (DMEPMA) by one step polymerization in N-methylpyrrolidone (NMP). The polyimides are soluble in organic solvents e.g. tetrahydrofuran (THF), dimethylformamide (DMF), dimethylacetamide (DMAc), N-methylpyrrolidone (NMP), methylene chloride, and cylcohexanone (CHXON). The films can be formed by casting their solutions. The films exhibit good mechanical properties and thermal resistance. The polyimides exhibit better resistance to alkali than Kapton film. The thermal resistance of polyimides was studied by TGA and DMA. These kinds of polymiides could be applied in microelectronic fields.

Table 1 The solubility of polyimides in various solvents

PI	m-cresol	DMAc	NMP	THF	CH_2Cl_2	CHXON
PMDA	◎	×	◎	△	◎	◎
BPDA	◎	◎	◎	◎	◎	◎
BTDA	◎	◎	◎	◎	◎	◎
ODPA	◎	◎	◎	◎	◎	◎
BSAA	◎	◎	◎	◎	◎	◎

Note: DMEPMA was used as diamine. Inherent viscosity was determined in DMAc at 30℃.
Soluble; △, partly soluble; ×, insoluble.

Table 2 The physical properties of polyimide films

Dianhydride of PI	Tensile	Elongation	Tg	T_5℃		T_{10}℃		Water Absorption
	MPa	%	℃	N2	air	N2	air	(%)
PMDA	105	8.3	ND	446	428	514	469	2.17
BTDA	120	7.6	287	477	461	510	504	1.22
BPDA	131	12	322	495	463	538	523	0.56
ODPA	115	8.2	266	493	449	514	497	1.1
BSAA	93.1	9.7	244	493	473	509	510	0.9

Diamine: DMEPMA. Film was obtained by casting NMP solution of PI.

Table 3 The resistance to alkali for polyimide films

Type	PMDA	BPDA	BTDA	ODPA	BSAA	Kapton
Weigh loss (%)	18.6	0	0	0	1.5	40
Color change	No	No	No	No	No	Fading
Strength	Brittle	Good	Good	Good	Good	Brittle

Condition: 20% alkali solution in room temperature for two days.