Synthesis and Properties of copoly(ester-imide)s derived from bisphenol A bis(trimellitic anhydride) esters（BTPDA）

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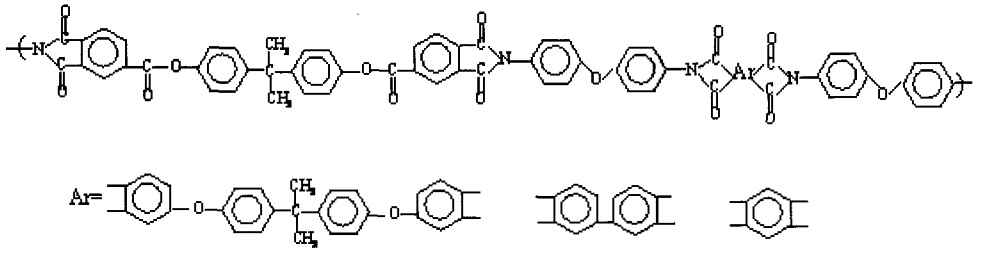
Polyester-imides have excellent electronic properties，mechanical and thermal properties，was in particularly useful as a base material for flexible printed circuits (FPC), impregnating insulating coatings of fh-motor, heat-resistant insulation material and wire enamel.

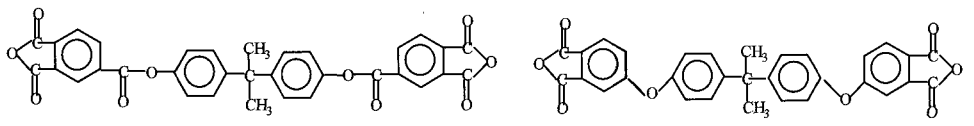
In the present study, a series of copolyester-imides were prepared by reacting 4,4'-oxydianiline (4,4'-ODA) with a dianhydride blend powder comprised of bisphenolA bis(trimellitic anhydride) esters （ BTPDA ） and another diferrent dianhydride such as 3,3',4,4'-Biphenyltetracarboxylic dianhydride （ BPDA ） ,4,4'-oxydiphthalic anhydride(ODPA) or ,pyromellitic dianhydride（PMDA）The copolyester-imide is represented by Scheme 1. Intrinsic viscosity of these copoly(ester-imide)s in N,N-dimethylacetamide (DMAC) ranged from 0.45-0.85dL/g. The glass-transition temperatures of these polymers were recorded between



Scheme 1

248~288°C by DSC and 5% weight loss temperatures of all polymers exceed 450°C in air, The polymer films were flexible and had a tensile strength in the range of 70–106 MPa, an elongation at break in the range of 2.6–6.1%. and it was found that these polymers have a high Tg, a low CTE and a better mechanical properties in comparison with those copolyimides which were obtained by replacing BTPDA with 4,4'-(4,4'-Isopropylidenediphenoxy) bis(phthalic anhydride)（BPADA）

According to the result of a series of contrastive experiment shown in table 1, The intrinsic viscosity of the polyester imide precursor decreased gradually as the proportion of BTPDA increased in consequence of rigid ester group. Then the glass transition temperature(Tg)、the tensile strength of the copolyester-imide were not linearly related to the proportion of BTPDA, the maximum Tg and the tensile strength was obtained when the molar percent of BTPDA was about 40%..



PTPDA　　BPADA

Scheme 2

Considering the similar structures of BTPDA & BPADA (shown in Scheme 2) ,The authors prepared 3 groups of copolyimides from ODA and blend dianhydrides under the same condition (shown in table 2). It was obviously found that copolyester imides had lower intrinsic

viscosity,higher glass transition temperature(Tg) ,lower CTE and much lower 5% weight loss temperature.Particularly there's a much higher Tg difference for the polyimides when BTPDA was copolymerized with PMDA,ODA(285.5-257.8=27.7℃) compared with BPADA.

Table 1. Copolyimides prepared from 4,4'-ODA/BTPDA/ Dianhydride

AGE 282		intrinsic viscosity (dL/g)	tensile strength (MPa)	fracture toughness (%)	Tg ℃
BTPDA/BPDA	3/7	85.35	72.3	2.6	252.13
	4/6	75.65	105.9	5.9	260.48
	5/5	65.87	98.1	6.1	248.60
	6/4	60.41	88.2	6.0	250.64
	10/0	45.90			
BTPDA/ODPA	4/6	63.43	95.8	6.1	251.05
	5/5	58.44	86.1	4.6	247.79
BTPDA/PMDA	4/6	68.33	70.0	3.1	288.23
	5/5	65.33	79.8	4.4	285.50

Table 2 Copolyimides comparasion (BTPDA & BPADA)

E 2282	intrinsic viscosity (ml/g)	tensile strength (MPa)	fracture toughness (%)	Tg ℃	CTE(μm/(m.℃)		TGA 5% ℃
					30～100℃	100～200℃	
BTPDA/BPDA	65.87	98.1	6.1	250.58	41.3	61.99	463.39
BPADA/BPDA	128.07	88.6	6.2	248.60	52.63	64.27	538.43
BTPDA/ODPA	58.44	86.1	4.6	247.79	55.64	64.36	453.64
BPADA/ODPA	108.78	101.8	8.1	240.92	57.41	74.26	518.64
BTPDA/PMDA	65.33	79.8	4.4	285.50	49.57	58.28	467.62
BPADA/PMDA	105.82	102.9	7.5	257.80	56.01	69.16	528.69

Keywords: polyester-imide,copolyimide,bisphenolA bis(trimellitic anhydride) esters

Reference(omitted):