카르복시 산가가 Bis(2-hydroxyethyl Terephthalate)의 축합중합 반응에 미치는 영향

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Effect of initial acid value on the polycondensation raction of bis (2-hydroxyethyl)terephthalate was investigated. Poly(ethylene terephthalate) (PET) was polymerized at 280°C for 3hrs under the vacuum of 0.1-0.3 mmHg in the various catalyst systems including Sb_2O_3, GeO_2, and $Ti(OBt)_4$ with the addition of terephthalic acid (TPA), and molecular weight of the polymer was compared with that of the polymer polymerized without the addition of TPA. It was found that the molecular weight of PET polymerized in the presence of TPA increases and each catalyst system has an optimum initial acid value at which the intrinsic viscosity of PET produced exhibits maximum and carboxyl content is minimum (Table 1).

However, the molecular weight distribution, content of cyclic oligomer, and the composition of cyclic oligomers' homologous series were not affected by the addition of TPA.

Table 1. Intrinsic viscosity(η), number averaged degree of polymerization ($\bar{P}n$), carboxyl content ([COOH]), and melting point(Tm) of PET polymerized at 280°C for 3hrs under the vacuum of 0.1-0.3 mmHg in various catalyst systems with or without the addition of TPA

Catalyst system No.	Catalyst (mole/mole BHETx10^4)	Initial acid value (eq/10^6g BHET)	$[\eta]$	$\bar{P}n$	[COOH] (eq/10^6g PET)	Tm(°C)
1	GeO_2(0.43)	0	.70	86	25.24	254.8
		150	.65	77	23.27	255.2
		250	.64	75	27.86	255.0
		350	.61	69	18.12	152.8
		450	.64	74	20.42	253.8
2	Sb_2O_3(2.4)	0	.76	96	24.50	253.2
		150	.76	96	22.77	253.0
		250	.76	97	22.77	254.3
		350	.86	118	20.90	255.7
		450	.85	115	23.66	255.3
3	$Ti(OBt)_4$ (1.5)	0	.73	92	34.78	251.0
		150	.98	146	31.91	250.5
		250	.95	139	34.15	250.1
		350	.88	122	34.70	250.4
		450	.92	132	37.35	252.5
4	Sb_2O_3(2.4) GeO_2(0.43)	0	.71	88	35.64	254.3
		150	.70	87	33.45	251.4
		250	.80	105	34.94	253.0
		350	.84	115	31.88	253.8
		450	.89	125	28.63	253.5
		550	.78	102	37.55	251.8
5	$Ti(OBt)_4$ (1.5) GeO_2(0.43)	0	.76	98	32.12	253.5
		150	.78	101	30.20	254.6
		250	.83	115	27.40	254.0
		350	.93	133	27.87	254.0
		450	.89	125	28.73	253.2
6	$Ti(OBt)_4$ (1.5) Sb_2O_3(1.2)	0	.77	100	85.78	251.8
		150	.90	128	74.84	251.6
		250	.99	147	75. 4	251.9
		350	.94	137	75.96	252.2
		450	.92	130	83.22	252.8
7	$Ti(OBt)_4$ (1.5) Sb_2O_3(1.2) GeO_2(0.43)	0	.97	142	35.83	255.1
		150	.97	144	29.50	253.7
		250	.89	123	28.72	252.6
		350	.82	109	29.73	252.3
		450	.72	90	30.37	253.0