Viscotek
The Leader in Polymer Characterization

POLYETHYLENE TEREPHTHALATE

Dilute Solution Viscosity Application Note 1

Detectors

Viscotek Model Y-501 Relative Viscometer
SASP Preparation System

The Viscotek Y-501 Relative Viscometer and SASP preparation system provide excellent results for the solution viscosity of polyester terephthalate (PET) resins.

In this analysis, two solvents were used, with identical findings. Sample preparation was made on the SASP system at 0.500 g/dL (weight/volume) with a correction for thermal expansion.

The OCP samples were heated to 100°C and stirred for 90 minutes. They were run in duplicate preparation and duplicate injections from each vial to show the precision of both the viscometer and the sample preparation system.

The exact measurements of the PET/OCP samples are given below. Note precision of the thermal expansion correction from the room temperature concentration to the analytical temperature concentrations.

Vial	Sample (g)	Volume (mL)	Room Temp Conc (g/dL)	Analytical Temp Conc (g/dL)
1A	0.1925	38.25	0.5034	0.4999
1B	0.1649	32.75	0.5036	0.5002
2A	0.1794	35.63	0.5036	0.5002
2B	0.1829	36.32	0.5035	0.5001
3A	0.1606	31.90	0.5035	0.5000
3B	0.1897	37.67	0.5035	0.5001
4A	0.1701	33.80	0.5034	0.4999
4B	0.1763	35.03	0.5035	0.5000
5A	0.1750	34.75	0.5036	0.5002
5B	0.1754	34.85	0.5033	0.4999

The phenol/TCE proved to be a better solvent for dissolution of the samples. The SASP preparation system was used to prepare single volumes of each phenol/TCE sample. Duplicate injections were made from each vial.

The Viscotek Model Y-501 Relative Viscometer measures solution viscosities of the sample relative to the reference solvent simultaneously, thereby avoiding errors due to temperature fluctuation and solvent variations.

- Total solvent usage per sample with duplicate injections, including washing: 50 mL
- Time of analysis per injection: 5.5 minutes
- Average standard deviation of analysis: Less than 0.0003
- Both solvent dispensing and sample analysis are done in a closed loop system to minimize solvent exposure and fumes.

Run Conditions

Solvents: OCP and 60% Phenol / 40% TCE
Temperature: 30° C
Concentration: 0.500 g/dL

The following tables detail the accuracy and precision of the Y-501 Viscometer. Below is the data for the OCP samples:

Sample	Injection	Run	Specific Viscosity	Inherent Viscosity (dL/g)
PET1	A	1	0.3306	0.5713
		2	0.3312	0.5723
	B	1	0.3323	0.5737
		2	0.3329	0.5745
PET2	A	1	0.3242	0.5615
		2	0.3244	0.5617
	B	1	0.3239	0.5610
		2	0.3240	0.5613
PET3	A	1	0.3238	0.5609
		2	0.3239	0.5611
	B	1	0.3240	0.5612
		2	0.3244	0.5618
PET4	A	1	0.3528	0.6059
		2	0.3542	0.6066
	B	1	0.3539	0.6059
		2	0.3539	0.6059
PET5	A	1	0.3299	0.5700
		2	0.3299	0.5700
	B	1	0.3293	0.5695
		2	0.3293	0.5695

The data for the samples run in 60% phenol / 40% TCE is shown in the table below. Note the reproducibility within each run.

Sample	Run	Specific Viscosity	Inherent Viscosity (dL/g)
PET1	1	0.3791	0.6426
	2	0.3792	0.6429
PET2	1	0.3716	0.6317
	2	0.3723	0.6328
PET3	1	0.3690	0.6284
	2	0.3690	0.6284
PET4	1	0.4037	0.6780
	2	0.4039	0.6784
PET5	1	0.3753	0.6372
	2	0.3751	0.6370

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