

National Bureau of Standards Certificate

Standard Reference Material 1490

Polyisobutylene Solution in Cetane (Viscosity and First Normal Stress Difference)

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This Standard Reference Material is intended for the calibration and checking of instruments used in polymer technology and science for the determination of rheological properties of polymer melts or solutions. This particular solution was selected because of its relatively low flow activation energy and its long shelf-life stability.

Certified Values at 25.0 °C

Rate of Shear	Viscosity	First Normal Stress Difference
s^{-1}	Poise	N/m^2
0.0177	452	
0.0354	452	
0.0700	451	
0.12	447 ^a	
0.28	432	
0.56	408	13.0 ^d
1.11	356	33.5
2.22	308	77
4.45	241	160
8.80	179	310
17.7	125.5	540
35.5	83.0	910
70.0	53.5	1450
140.0	32.5 ^b	
280.0	19.7 ^c	

^aThis value was obtained using a calibrated capillary viscometer (Cannon Master) with the rate of shear taken at the capillary wall.

^bBecause there were indications of flow instability and viscous heating this value may be low.

^cThough all precautions were taken to obtain this data point in less than 0.5 s, we cannot estimate the error.

^dDue to the small value of the force, the scatter of the values was $\pm 10\%$.

The technical and support aspects involved in the certification and issuance of this Standard Reference Material were coordinated through the Office of Standard Reference Materials by R. K. Kirby.

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The data on viscosity and first normal stress difference were obtained using a cone and plate arrangement. A cone of 1.5° was used for the viscosity measurements and a check with newtonian fluids under identical conditions (environmental & experimental) yielded values within less than $\pm 1\%$ of the determined value from our standard capillary viscometers, where the viscosity values are known to better than 0.5%. The first normal stress difference data are the average values of five runs obtained with different cones the angles of which were 1.5° and 2.29°. The extreme values, unless otherwise indicated, were within ± 5 percent.

Values of the zero shear viscosity are given at other temperatures so that with the application of the time-temperature superposition the certified data can be extended within the range of these temperatures.

Temperature Dependency

Temperature	Zero shear viscosity	Density
°C	poise	g/mL
20.1	530	0.7819
25.0	452	0.7802
30.1	388	0.7784