

Viscosities of Aqueous Glycol Solutions

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Viscosities of aqueous solutions of ethylene glycol, triethylene glycol, and polyethylene glycol (average molecular weight 380 to 420) as functions of their compositions are reported.

VISCOSITIES of pure ethylene glycol, triethylene glycol, and polyethylene glycol (average molecular weight 380 to 420) and their aqueous solutions for the whole concentration range were measured with a calibrated Cannon-Fenske routine type viscometer. The calibration was verified using two standard solutions of known viscosities. The results of

viscosity measurement are recorded in Table I. The estimated accuracy of measurement was $\pm 0.3\%$. The temperature was controlled at $25^\circ \pm 0.02^\circ \text{C}$.

In Figure 1, the viscosities are plotted on the logarithmic scale against the mole fractions of glycols. To calculate the mole fraction of polyethylene glycol, the molecular weight was taken to be the average value, 400. At low concentration of glycols, the slope of the viscosity concentration curve increases with the increase in molecular weight of glycols, while the slope does not have a significant change at the higher concentration range (Figure 1). The viscosity-concentration curve shows a fairly drastic change in slope at approximately 0.4 mole fraction for ethylene glycol, 0.2 for triethylene glycol, and 0.1 for polyethylene glycol. Available viscosity data of glycol solutions (2, 3), including those for aqueous diethylene glycol solution (4) for which the measurement was not carried out, are also plotted in Figure 1 for comparison.

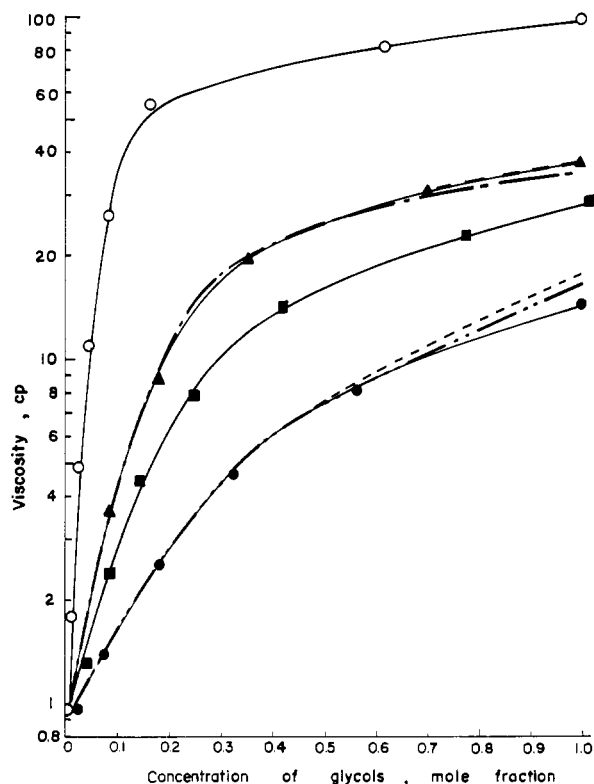


Figure 1. Viscosity vs. concentration for glycol-water systems at 25°C .

- Ethylene glycol
- Polyethylene glycol 400
- ▲ Triethylene glycol
- Ethylene glycol (4)
- Ethylene glycol (2)
- Diethylene glycol (4)
- .-.- Triethylene glycol (4)
- .-.- Triethylene glycol (2)

Table I. Viscosities of Ethylene, Triethylene, and Polyethylene Glycols and Their Aqueous Solutions at 25°C .

Ethylene Glycol		Triethylene Glycol		Polyethylene Glycol	
Concn. glycol, wt. %	Viscosity, cp.	Concn. glycol, wt. %	Viscosity, cp.	Concn. glycol, wt. %	Viscosity, cp.
100	14.78	100	37.26	100	99.01
81.52	8.36	81.78	19.77	90.77	80.00
63.09	4.73	62.69	8.70	76.83	49.74
42.28	2.58	42.80	3.65	63.16	22.52
0.0	0.8937 (1)	0.0	0.8937 (1)	48.57	9.95
				33.17	4.132
				16.62	1.87

LITERATURE CITED

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