Viscosity Overview

The original patent for Zahn cups was issued in 1938. These early cups, though uncalibrated and unstandardized, were worth their weight in gold in the hands of a skilled formulator. Gradual improvements in design and quality followed, but it was not until quite recently that standardization among viscosity cups became the norm.

Now, thanks to rigorous quality standards, the drain time of a liquid through a known cup can be compared from lab to lab, with a known margin of error. The EZ® and S90 "Signature" series viscosity cups are manufactured to the strictest tolerances, and, when appropriately calibrated with the standard oils, can be used with assurance for such lab-to-lab comparisons.

This method measures viscosity at only one level of shear; it cannot monitor thixotropy or other second order rheological properties, nor can its results be directly compared to readings taken in-situ from a dynamic process. Nevertheless, the viscosity cup is still – and likely will long remain – a core tool for formulators and users of inks, paints, coatings, adhesives, and many other liquids.

Molecular Weight, Density, Surface Tension, and Viscosity of Selected Liquids

Name	Molecular Formula	Mol.Wt.	Specific Density (1)	Surface Tension (2)	Viscosity	
					Centipoise	Centistokes
Acetic acid	$C_2H_4O_2$	60.05	1.043	27.5	1.06	1.02
Acetone	C_3H_6O	58.08	0.786	23.5	0.31	0.39
Butyl acetate	$C_6H_{12}O$	116.16	0.876	24.3	0.69	0.78
Cyclohexane	C_6H_{12}	84.16	0.773	25.3	0.89	1.16

Cyclohexanol	$C_6H_{12}O$	100.16	0.960	33.4	57.5	59.9
Ethanol	C_2H_6O	46.07	0.787	22.5	1.08	1.37
Ethanolamine	C_2H_7NO	61.08	1.014	48.9	21.1	20.8
2-Ethoxyethanol	$C_4H_{10}O_2$	90.12	0.931	28.9	1.85	1.99
Ethyl acetate	$C_4H_8O_2$	88.11	0.894	23.9	0.42	0.47
Ethylene glycol	$C_2H_6O_2$	62.07	1.110	48.3	16.1	14.5
Formamide	CH_3NO	45.04	1.130	58.1	3.34	2.96
Formic acid	CH_2O_2	46.03	1.220	37.1	1.61	1.32
Methanol	CH_4O	32.04	0.787	22.4	0.54	0.69
Methyl acetate	$C_3H_6O_2$	74.08	0.927	24.7	0.36	0.39
Methyl ethyl ketone	C_3H_8O	72.11	0.799	24.6	0.41	0.51
1-Propanol	O_4H_8O	60.10	0.802	23.7	1.95	2.43
Toluene	C_7H_8	92.13	0.865	28.5	0.56	0.65
Water	H_2O	18.02	0.998	72.8	0.89	0.89

(1) g/ml @ 20°C (2) dynes/cm @ 20°C (3) Viscosity as measured @ 25°C. Centistoke is a measure used in viscosity cup tests; it equals centipoise divided by specific density.

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Manufacturers of Accudyne Dyne pens.