Viscosity Encyclopedia Article

Viscosity

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Viscosity

Viscosity is a physical property of **liquids** which is a measure of a liquid=s resistance to flow. In practical terms, it provides an indication of the thickness of a liquid. Its value is dependent on **intermolecular forces** in the liquid and the molecular complexity of the compound. When large intermolecular forces are present, a liquid will tend to be thick or highly viscous. For example, glycerin is thick because it has a high capacity to form **hydrogen** bonds with itself. Liquids that have complex **molecular structure** viscosity will also tend to be higher because the molecules can become entangled.

Any material that flows exhibits viscosity. The unit of measure typically used for viscosity is poise or centipoise. The viscosity measurement for **water** is defined as 1 centipoise. Oils are thicker, having values between 100 and 100,000 centipoise. High **molecular weight** polymers can have viscosity values in the millions of centipoise range.

Liquids can be classified by the type of flow behavior they exhibit. In Newtonian fluids, the shear stress is in direct proportion to the shear rate. This means that the viscosity measurement will remain constant even after several viscosity measurements. Examples of Newtonian fluids include water, glycerin, and light oils. In non-Newtonian fluids, the viscosity measurements change depending on shear stress. Shear thinning fluids exhibit a reduced viscosity value as the shear rate is increased. Shear thickening fluids have higher viscosity values as shear rate is increased.

The viscosity of certain systems is time-dependent. These systems are called thixotropic and are characterized by a difference in viscosity, depending on the speed at which the shear force is applied. An example of this type of system is ketchup. When left in a bottle undisturbed, ketchup remains thick. When enough force is put on the system it immediately thins.

Viscosity is an important quality control characteristic for a variety of products. It is used to ensure that such products as shampoos, hand creams, paints, and **inks** are stable. Additionally, it is used to measure the molecular weight of polymers and determine when a polymerization reaction is complete.