

Difference Between Ostwald and Ubbelohde Viscometers

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Key Difference – Ostwald vs Ubbelohde Viscometers

A viscometer is a chemical instrument that is used to measure the viscosity of a fluid. The major fluid types are gases and liquids. The viscosity of a fluid is the resistance of that fluid to deformation. Ostwald viscometer and Ubbelohde viscometer are two types of analytical instruments that are used to measure the viscosity of a fluid quantitatively. The key difference between Ostwald and Ubbelohde viscometers is that **Ostwald Viscometer is suitable for the measurement of low to moderate viscosity of liquids whereas Ubbelohde viscometer is suitable for the measurement of high viscosity of liquids.**

What are Ostwald Viscometers

Ostwald Viscometer or U-tube viscometer is a chemical instrument that is used to measure the viscosity of a liquid with a known density. This viscometer is named after the German chemist, Wilhelm Ostwald. This viscometer is a U-tube with two bulbs separated by a capillary tube. The two bulbs act as reservoirs for the liquid. The small reservoir is located at a higher level than the larger reservoir. There are two marks at the top and the bottom of the small bulb.

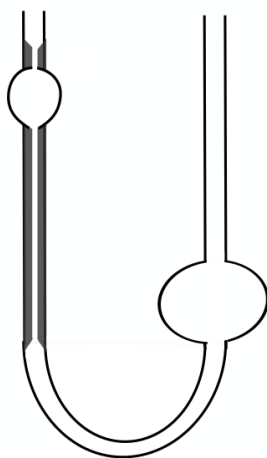


Figure 01: A Schematic Diagram of Ostwald Viscometer – (the Dark Colored Part is the Capillary Tube)

When taking a measurement from Ostwald viscometer, the liquid is filled to the viscometer. The liquid should be pulled to the upper reservoir by suction. Then, the liquid is allowed to fall down under [gravity](#) until it reaches the lower reservoir. The time taken by the liquid to pass the two marks at the top and the bottom of the small bulb is measured.

Principle of Ostwald Viscometer

The viscosity of the liquid can be determined by comparing it with a reference liquid. Here, the instrument is calibrated with a reference liquid such as pure water (deionized water). The viscosity of the sample can be calculated as follows.

$$\eta_1 = \eta_2 (\rho_1 t_1 / \rho_2 t_2)$$

Where η_1 and η_2 are viscosities of the sample and reference liquid respectively, ρ_1 and ρ_2 are densities of sample and reference, respectively. The terms t_1 and t_2 are the times taken to pass the top and bottom marks of the small bulb by the sample and reference, respectively.

What are Ubbelohde Viscometers

Ubbelohde viscometer is a chemical instrument that is used to measure the viscosity of a liquid. It is a capillary-based method. This apparatus is suitable to take measurements with high viscosity liquids. Ex: high viscosity cellulosic polymer solutions. This instrument is named after the physicist Leo Ubbelohde.

One major advantage of this instrument is that the values obtained by this viscometer are independent of the total volume of the liquid used. The instrument contains two bulbs: one is known as a reservoir and the other one is a measuring bulb. The two bulbs are connected by a capillary tube. There is an air tube as well.

At first, the liquid is filled to the reservoir bulb (large bulb located in the lower level). Care must be taken to avoid the liquid entering the air tube. The instrument is kept in a temperature controlled liquid bath until the liquid inside the viscometer equals the temperature of the liquid bath. Then, the liquid is pulled to the measuring bulb via suction using a rubber tube connected to the air tube. Then rubber tube should be sealed to avoid the liquid falling back to the reservoir.

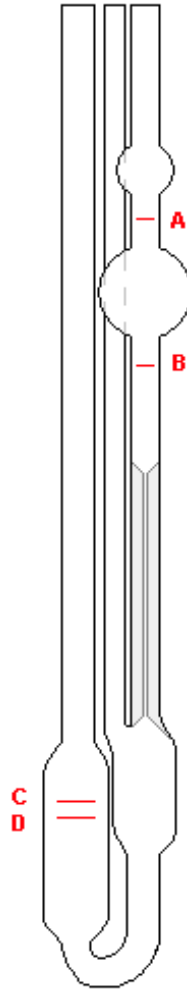


Figure 02: Ubbelohde Viscometer

Then the rubber tube is released, allowing the liquid to fall down. The flow rate is determined by measuring the time elapsed for the liquid to flow across the two marks present at the top and the bottom of the measuring bulb.

What are the Similarities Between Ostwald and Ubbelohde Viscometers?

- Both are U-shaped instruments.
- Both instruments have two glass bulbs.
- Both instruments use capillary tubes.

What is the Difference Between Ostwald and Ubbelohde Viscometers?

Ostwald vs Ubbelohde Viscometers	
Ostwald Viscometer or U-tube viscometer is a chemical instrument that is used to measure the viscosity of a liquid with a known density.	Ubbelohde viscometer is a chemical instrument that is used to measure the viscosity of a liquid.
Invention	
Ostwald Viscometer was invented by the German chemist Wilhelm Ostwald.	Ubbelohde viscometer was invented by the physicist Leo Ubbelohde.
Liquid Sample	
Ostwald Viscometer is suitable for the measurement of low to moderate viscosity of liquids.	Ubbelohde viscometer is suitable for the measurement of high viscosity of liquids.
Advantages and Disadvantages	
Ostwald Viscometer is a simple instrument and easy to handle.	The values obtained by this viscometer are independent of the total volume of the liquid used.

Summary – Ostwald vs Ubbelohde Viscometers

Viscometers are chemical instruments used to measure the viscosity of a liquid. Ostwald Viscometer and Ubbelohde viscometer are two such instruments. The key difference between Ostwald and Ubbelohde viscometers is that Ostwald Viscometer is suitable for the measurement of low to moderate viscosity of liquids whereas Ubbelohde viscometer is suitable for the measurement of high viscosity of liquids.

Reference:

1. Tenison Basumatary. "Viscosity measurement using Ostwald viscometer." LinkedIn SlideShare, 17 Oct. 2015, [Available here](#).

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