Isochoric processes

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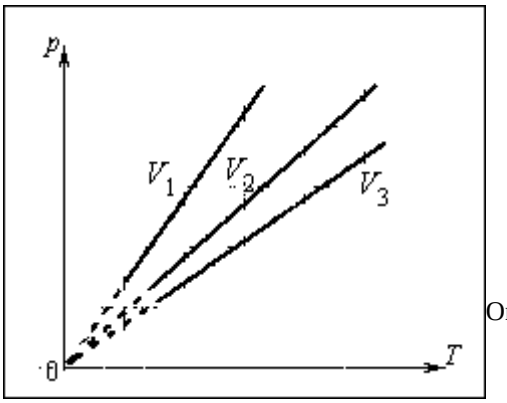
Introduction to Isochoric processes

In an isochoric process, there isn't a change in volume. It’s a process of quasi-static heating or cooling a gas at constant volume V provided that the quantity ? in the vessel remains unchanged.

$$\frac{p}{T} = \text{const.}$$



On the plane (p, T), isochoric processes for a given amount of substance ? for different values of V represents the family of straight lines, which are called isochores.

Large values correspond to isochores with a smaller slope with respect to the temperature axis.

The family of isochores in the plane (p, T). V 3> V 2> V 1

What is an isochoric process?

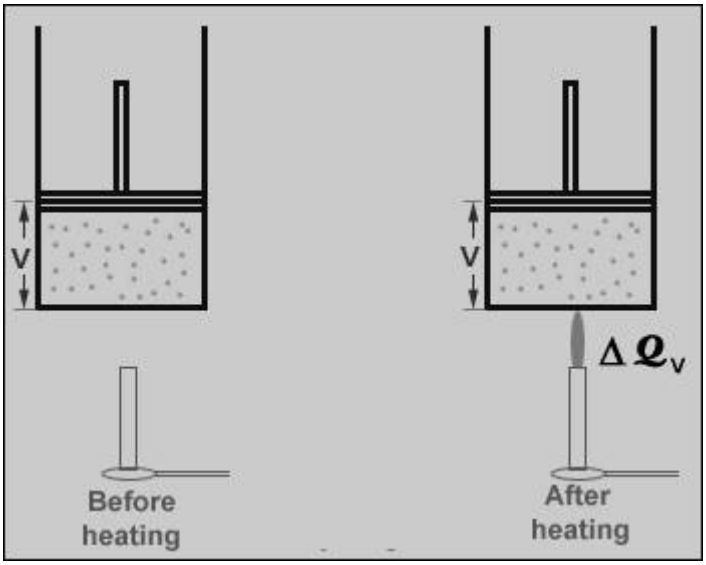
An**isochoric process** is one in which the volume is kept constant, meaning that the work done by the system amounts to zero. It follows that, for a simple system of two dimensions, any heat energy transferred to the system externally will be absorbed as internal energy. An isochoric process is also known as an**isometric** process or an**isovolumetric** process.

Internal Energy

Every substance is associated with a definite amount of energy which depends on its chemical nature as well as its temperature, pressure and volume. This energy is known as internal energy. The internal energy of a system is the energy possessed by all its constituent molecules.

Internal energy is a state property, i.e., its value depends only on the state of the substance and does not depend on how that state is achieved. The absolute value of internal energy of a substance cannot be determined. However, determining the absolute values of internal energies is neither necessary nor required. It is the change in internal energy accompanying a chemical or a physical process that is of interest and this is a measurable quantity.

Explanation



Consider a cylinder fitted with a frictionless piston. An ideal gas is enclosed in the cylinder.

The piston is fixed at a particular position so that the volume of the cylinder remains constant during the supply of heat.

Assume that DQ amount of heat is added to the system. This addition of heat causes the following changes in the system:

- Internal energy increases from U1 to U2. Volume of the system remains same. Temperature increases from T1 K to T2 K. Pressure increases from P1 to P2. No work is done.

According to the first law of thermodynamics:

DQ = DU+ DW

But DW = PDV

Thus

DQ = DU+ PDV

As

DV = 0

DQ = DU+ P (0)

DQ = DU

This expression indicates that theheat supplied under an isochoric process is consumed in the system's increasinginternal energy, but nowork is done.

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Reference links:

- http://www.en.wikipedia.org/wiki/piston
- http://www.askiitians.com/iit.../Isochoric-Reversible-Irreversible-Process
- http:// www.wordiq.com/definition/Isochoric_process

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