# Molar heat capacity = c

@wikipedia

Amount of heat required to change the temperature of one unit of mole by one unit of temperature:

(1) $$c = \frac{C}{\nu} = \frac{1}{\nu} \cdot \frac{\delta Q}{\delta T}$$

where

| | | | |
|---|---|---|---|
| $\nu$ | amount of chemical substance | $C$ | heat capacity of the material |

| Symbol | Dimension | SI units | Oil metric units | Oil field units |
|---|---|---|---|---|
| $c$ | M L$^{2}$ T$^{2\ 1}$ | J/(molK) | J/(molK) | BTU/(mol°R) |

Molar Heat Capacity is related to Specific Heat Capacity $c_m$ and Volumetric Heat Capacity $c_v$ as:

| | |
|---|---|
| (2) $c = M \cdot c_m$ | (3) $c = V_m \cdot c_v$ |

where

| | | | |
|---|---|---|---|
| $M$ | molar mass of the substance | $V_m$ | molar volume of the substance |

Molar Heat Capacity depends on the way the heat is transferred and as such is not a material property.

The two major heat transfer processes are isobaric and isohoric which define:

| Isobaric molar heat capacity ($c_P$) | Isochoric molar heat capacity ($c_V$) |
|---|---|

The relation between Isobaric molar heat capacity and Isochoric molar heat capacity is given by Mayer's relation which particularly implies that Isobaric molar heat capacity is always greater than Isochoric molar heat capacity:

(4) $$c_P \geq c_V$$

For incompressible matter the Isobaric molar heat capacity ($c_P$) and Isochoric molar heat capacity ($c_V$) are identical:

(5) $$c_P = c_V$$

Most solids have about the same Molar Heat Capacity:

(6) $$c_P \approx c_V \approx 3\,R \approx 24.94\ \mathrm{J/(mol \cdot K)}$$

where

| | |
|---|---|
| $R$ | Gas constant |

For the ideal gas the Molar Heat Capacity is predicted as:

| | |
|---|---|
| (7) $c_V = \frac{f}{2} R$ | (8) $c_P = c_V + R = \frac{f+2}{2} R$ |

where

| | |
|---|---|
| $f$ | number of molecular freedom degrees |

Most aklanes reach values (7) and (8) at very high temperatures (thousands of K).

The Molar Heat Capacity of the mixture in thermodynamic equilibrium follows the simple mixing rule:

(9) $$c = \sum_i x_i \, c_i$$

where

| | |
|---|---|
| $x_i$ | mole fraction of the $i$-th mixture component, subjected to $\sum_i x_i = 1$ |
| $c_i$ | molar heat capacity of the $i$-th mixture component |

## See also

Physics / Thermodynamics / Thermodynamic process / Heat Transfer / Heat Capacity

[ Heat ][ Heat Capacity Ratio () ][ Mayer's relation ]