

- If there is only mechanical work. $W = -P\Delta V$
expansion/compression

If there is other form of work. $W = -P\Delta V + W_{\text{other}}$

$$= \Delta U - (-P\Delta V)$$

e.g. electric work.

chemical work

e.g. For demand of water at 10 km,

e.g. Handbook data.

Under 1 atm pressure,

ΔH for vapourizing 1 mole of water =

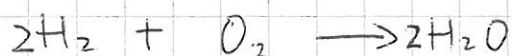
$$\Delta H = 40,660 \text{ J}$$

That's the latent heat.

2 parts: $\left\{ \begin{array}{l} \text{Vapour has more energy, } \Delta U. \\ \text{Vapour occupies more space: } P\Delta V \\ \text{OR. } P\Delta V \\ \sim 8\%. \end{array} \right.$

e.g. Handbook data.

Burning H_2 gas and producing water _{Liquid}
under 1 atm pressure.



ΔH for producing 1 mole of water:

$$\Delta H = -286 \text{ kJ}$$

↳ output heat.

again 2 reasons:

(1) $2\text{H}_2, \text{O}_2$ contains more energy than $2\text{H}_2\text{O}$.
 ΔU

(2) Gases occupy more space than water.
 $P\Delta V \approx PV$

• C_p — Heat Capacity at constant P .

$$C_p = \left(\frac{\partial H}{\partial T} \right)_p = \left(\frac{\partial U}{\partial T} \right)_p + P \left(\frac{\partial V}{\partial T} \right)_p.$$

A better name for C_p would be: "Enthalpy capacity"

(Not: ΔH could include heat and other work!)

Note: $\left(\frac{\partial H}{\partial T} \right)_p$ is different from $\left(\frac{\partial H}{\partial T} \right)_V$.

$\uparrow$
Fixed P .

$\uparrow$
Fixed V .

In general, for a function $F = f(x, y, z)$.

$$\left(\frac{\partial F}{\partial x} \right)_y \neq \left(\frac{\partial F}{\partial x} \right)_z.$$



Don't omit the subscript!

That's an important difference in thermodynamics!

Note: specific enthalpy:

$$h = \frac{H}{m} \quad (\text{per unit mass})$$