Day 1

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- Extensive properties — Quantity dependent (eg: H, U)
- Intensive properties — Quantity independent (eg: T)
  - $\rightarrow$ mass based (h, u)
  - $\rightarrow$ mole based $(\bar{h}, \bar{u})$
- Ideal gas eqⁿ: $PV = N R_u T$

  $R_u \rightarrow$ universal gas constant (8.314 $JK^{-1} mol^{-1}$)

$R = \frac{R_u}{M}$

$M \rightarrow$ molar mass (kg/kmol)

- Thermally perfect gas: $C_p, C_v = f(T)$ only

$$u(T) - u(T_{ref}) = \int_{T_{ref}}^{T} C_v \, dT$$

$$h(T) - h(T_{ref}) = \int_{T_{ref}}^{T} C_p \, dT$$

$T_{ref} \rightarrow$ 298 K for this course

- Calorifically perfect gas: C_p, C_v is constant over a range of temperature

- Ideal gas mixtures:

N_1 : moles of species 1

N_2 : " " " 2

Total mass, $m = \sum_{i=1}^{K} m_i$

$m_i \rightarrow$ mass of species i.

Total moles, $N = \sum_{i=1}^{K} N_i$

$y_i \rightarrow$ mass fraction $= \frac{m_i}{m}$

$x_i \rightarrow$ mole fraction $= \frac{N_i}{N}$

$y_i = \frac{x_i M_i}{M}$, $M_i \rightarrow$ molar mass of species i.

$\bar{h}_{mix} = \sum y_i \bar{h}_i$

$h_{mix} = \sum x_i h_i$

- Dalton's Partial Pressure law:

$$\frac{P_i}{P} = \frac{N_i}{N} = x_i$$

$P_i \rightarrow$ partial pressure of ith species

$P \rightarrow$ total pressure.