§ 3.5 THE THERMODYNAMIC PROPERTY 'ENTHALOPY'

the thermodynamic property enthalpy is another state property defined as.

$$H \equiv U + P\forall \quad (J)$$

where

H: enthalopy (kJ)
U: internal energy (kJ)
P: pressure (kPa)
$\forall$: volume (m^3)

Enthalopy can also be defined per unit mass as, specific enthalopy.

$$h = \frac{H}{m} = \frac{U}{m} + P\frac{\forall}{m} = u + Pv$$

Enthalopy is a combination of properties

The property enthalopy is also tabulated.

§ 3.6 GASES: THE IDEA GAS EQUATION

when the vapour phase of a substance has a relitively low density (ρ), the P, v, and T. can be related ~~by~~ the simple relationship model.

$$Pv = RT.$$

P: pressure (Pa)
v: sp. volume (m^3/kg)
T: absolute temperture (K)
R: gas constant ($J/kg \cdot K$)

note: As per unit of P is taken as kPa → the unit for R has to be in ($kJ/kg \cdot K$)

Any gases which is valid is called an Ideal gas.

REMARK: The gas constant R can also be expressed by the relationship

$$R \equiv \frac{\bar{R}}{M}$$

$\bar{R}$: universal gas constant $= 8.3145 \frac{kJ}{kmol \cdot K}$

M: molecular

Ex. M for N_2 (nitrogen) is $\cong 2 \times 14 = 28\ kg/kmol$

M for CO_2 (carbon dioxide) is

$\cong 1 \times 12 + 2 \times 16 = 44\ kg/kmol$

The ideal gase eqauation (model) can also be expressed as $P\forall = mRT$

note $\left(\forall = mv = \frac{m}{\rho}\right)$

$\therefore\ P = \rho RT$

§3.7 FOR NON IDEAL (REAL) GASES

gas and vapour are often used interchangably. gases diviate from ideal gas behaviour at states and regions. The diviation from ideal gas behaviour at a given T&P can be accurately accounted by using "compressibility factor Z" defined.

$$Z = \frac{Pv}{RT}$$

$$Pv = ZRT$$

for real gases $Z > 1$ or $Z < 1$, the further from one, the more it deviates from ideal gas behaviour

Z for ideal gases is 1.

The compressibility factor Z can be determined for any given gas.
by using "generalized compressibility chart"
In this chart P_R (Pressure Reduced) and T_R (Temperture reduced) must be used, P_R and T_R can be calculated using.

$$P_R = \frac{P}{P_{CR}}$$ } pressure critical.

$$T_R = \frac{T}{T_{CR}}$$

} all in absolute.

REMARKS:

Z can be written by $Z = \frac{V_{act}}{V_{ideal}}$

when $v = \frac{RT}{P}$