

# (An Autonomous Institution) Department of Food Technology



# Properties of Glas Mixture :-

The Various proporties of gas mixture such as prossure, Volume temperature, internal energy, enthalpy, entropy and special heats.

### 1) Phressure :-

Using Dalton's law of partial pressure, the pressure of a mixture is the sum of pressure of each component at the temperature and volume of the mixture.

# ii) Volume :-

Using Amagat's law of partial Volumes, the volume of mixture is the sum of volume of each component at the temperature and prossure of the mixture.

# iii) Temperature :-

At any uniform mixture, the temperature is the same for. each component of the mixture.

# in) Internal Energy :-

For a mixture of ideal gases, the internal energy is given by.  $U_m = U_A \left( N_A, T_m \right) + U_0 \left( N_B, T_m \right) + U_0 \left( N_C, T_m \right).$ 



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(b)

Internal energy of a gas mixture per unit mass is given by,

$$U_{m} = \frac{U_{m}}{m_{m}} = \frac{U_{A} + U_{B} + U_{C}}{m_{m}}.$$

$$U_{m} = \frac{m_{A}U_{A} + m_{B}U_{B} + m_{C}U_{C}}{m_{m}}.$$

$$U_{m} = \frac{m_{A}U_{A} + m_{B}U_{B} + m_{C}U_{C}}{m_{m}}.$$

$$U_{m} = \frac{m_{A}U_{A} + m_{B}U_{B} + m_{C}U_{C}}{m_{m}}.$$

$$U_{m} = \frac{m_{A}U_{A} + m_{C}U_{C}}{m_{m}}.$$

$$U_{m} = \underbrace{k}_{i=1} x_{i} u_{i}.$$

where, mass function,  $x_i = \frac{m_i}{m_m}$ 

# v) Enthalpy :-

For a mixture of ideal gases, entholpy is given by,

$$H_{m} = \underbrace{\underbrace{K}_{i=1}^{m} H_{i}}_{i=1}.$$

$$H_{m} = \underbrace{K}_{i} \underbrace{M_{i} h_{i}}_{i}.$$

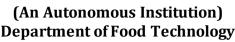
$$H_{m} = \underbrace{K}_{i} \underbrace{N_{i} h_{i}}_{i}.$$

Enthalpy for a gas mixture per unit mass is given by,

$$h_m = \frac{\mu_m}{m} = \frac{m_a h_A + m_B h_B + m_c h_c}{m_m}$$

$$h_m = \frac{m_A}{m_m} h_A + \frac{m_B}{m_m} h_B + \frac{m_c}{m_m} h_c .$$







# vi) Specific heats:

(T)

For a mixture of ideal gases, specific hears are given by wholen ,  $Cv_m = \frac{m_A C_{VA} + m_B C_{VB} + m_C C_{VC}}{m_C}$ 

$$= \frac{m_A}{m_m} C_{V_A} + \frac{m_B}{m_m} C_{V_B} + \frac{m_c}{m_m} C_{V_C} ,$$

$$= x_A C_{V_A} + x_B C_{V_B} + x_C C_{V_C} .$$

Similarly, Pressure,  $C_{Pm} = \frac{m_A}{m_m} C_{PA} + \frac{m_B}{m_m} C_{Pe} + \frac{m_C}{m_m} C_{Pe}$ 

## Vii) Glas Constant :-

 $R_m = \frac{m_A}{m_m} R_A + \frac{m_B}{m_m} R_B + \frac{m_c}{m_m} R_C .$ 

The gas constant of the mixture can also be obtained by,

$$R_m = \frac{R}{M_m}$$

Mm = molar mass of the mixture.

# Viii) Entropy ;-

Gibbs theorem States that the total entropy of a mixture

of gases is the sum of the partial entropies.

$$S_m = \sum_{i=1}^k S_i$$

$$S_{m} = \underbrace{k}_{i=1}^{k} m_{i} \vartheta_{i}$$

$$S_{m} = \underbrace{k}_{i=1}^{k} N_{i} \vartheta_{i}$$

Entropy for a gas mixture por unit mass is given by

$$S_{m} = \frac{S_{m}}{m_{m}} = \frac{m_{A}S_{A} + m_{B}S_{B} + m_{c}S_{c}}{m_{m}}.$$

$$= \frac{m_{A}}{m_{m}} S_{A} + \frac{m_{B}}{m_{m}} S_{B} + \frac{m_{c}}{m_{m}} S_{c}$$

$$= \frac{m_{A}}{m_{m}} S_{A} + \frac{m_{B}}{m_{m}} S_{B} + \frac{m_{c}}{m_{m}} S_{c}$$

$$= \frac{m_{A}}{m_{A}} S_{A} + \frac{m_{B}}{m_{B}} S_{B} + \frac{m_{c}}{m_{m}} S_{c}.$$

$$S_{m} = \frac{m_{A}}{m_{c}} S_{C} + \frac{m_{C}}{m_{c}} S_{C}.$$



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# Gibbs Function: Gibbs function: Gibbs dheorem states that the total energy of a mixture of gosses is the sum of the postial entropies. By Gibbs functions, G=h-Ts. dg=dh-dGs) dg=dh-Tds-SdT. dg=Tds+Vdp-Tds-SdT. dh=Tds+Vdp. dg=Vdp-sdT.