

Mixtures

Ideal gas mixtures

$$\mu_i^{v*}(T, P, \underline{y}) = \mu_i^{v*}(T, P_i) = P_i = P y_i$$

$$= \mu_i^{v*}(T, P_2) + RT \ln \frac{P_i}{P_2} = \mu_i^{v*}(T, P_2) + RT \ln \frac{P}{P_2} + RT \ln y_i =$$

$$= \mu_i^{v*}(T, P) + RT \ln y_i$$

$$d_T \mu_i^{v*}(T, P, \underline{y}) = RT \phi_T \ln P_i$$

Real gas mixtures

$$d_T \mu_i^v(T, P, \underline{y}) = RT \phi_T \ln f_i(T, P, \underline{y})$$

$$\lim_{P \rightarrow 0} \frac{f_i(T, P, \underline{y})}{P_i} = 1$$

→ from now on, only ideal gases

$$f_i^{v*}(T, P, \underline{y}) = P y_i$$

$$\mu_i^{v*}(T, P, \underline{y}) - \mu_i^{v*}(T, P) = RT \ln \frac{f_i^{v*}(T, P, \underline{y})}{f_i^{v*}(T, P)} = RT \ln y_i$$

Ideal liquid mixture

$$\mu_i^{L\phi}(T, P, \underline{x}) = \mu_i^L(T, P) + RT \ln x_i$$

$$f_i^{L\phi}(T, P, \underline{x}) = \frac{P_i^L(T, P)}{P} x_i$$

DEFINITION!

$$\mu_i^{L\phi} - \mu_i^L = RT \ln \frac{f_i^{L\phi}}{P_i^L} = RT \ln x_i$$

Real liquid mixture

$$f_i^L(T, P, \underline{x}) = f_i^{L\phi}(T, P, \underline{x}) \gamma_i(T, P, \underline{x}) =$$

$$= \frac{P_i^L(T, P)}{P} x_i \gamma_i(T, P, \underline{x})$$

γ_i , activity coefficient

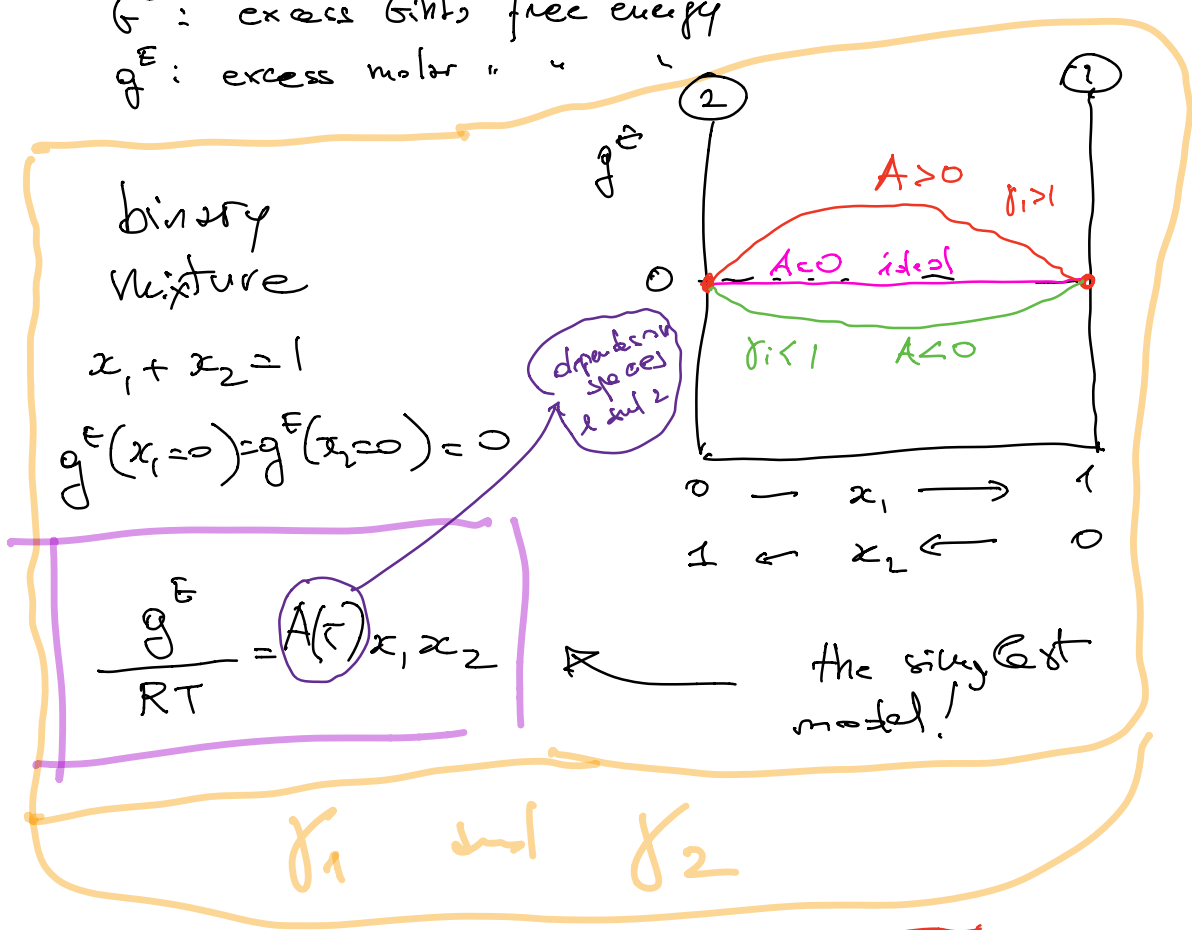
(1)

$$G(T, P, \underline{n}) = G^L(T, P, \underline{n}) + G^E(T, P, \underline{n}) \quad \text{definition?}$$

$$\begin{aligned} \mu_i^L(T, P, \underline{x}) - \mu_i^{LF}(T, P, \underline{x}) &= RT \ln \frac{f_i^L(T, P, \underline{x})}{f_i^{LF}(T, P, \underline{x})} = RT \ln \gamma_i(T, P, \underline{x}) \\ &= \left(\frac{\partial G}{\partial n_i} \right)_{T, P, n_{j \neq i}} - \left(\frac{\partial G^L}{\partial n_i} \right)_{T, P, n_{j \neq i}} = \left(\frac{\partial (n g^E)}{\partial n_i} \right)_{T, P, n_{j \neq i}} \end{aligned}$$

g^E : excess Gibbs free energy

g^E : excess molar " " " "



$$\left(\frac{n g^E}{RT} \right) = \left(A \frac{n_1 n_2}{(n_1 + n_2)^2} \right)$$

$$A x_2^2 = \frac{\partial (\quad)}{\partial n_1} = A \frac{n_2(n_1 + n_2) - n_1 n_2}{(n_1 + n_2)^2}$$

$$\ln \gamma_1 = A(\tau) (1 - x_1)^2$$

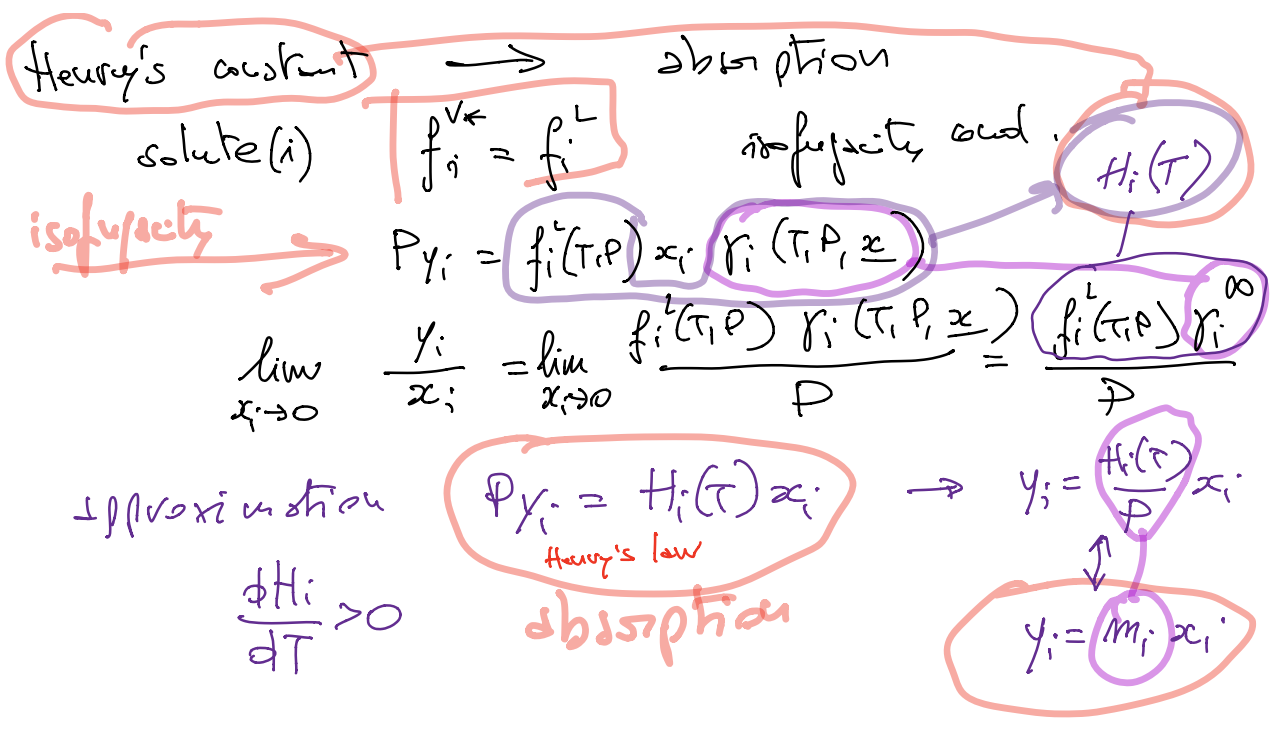
$x_1 \rightarrow 0 \rightarrow \gamma_1 = e^A = \gamma_1^{\infty}$

$$\ln \gamma_2 = A(\tau) (1 - x_2)^2$$

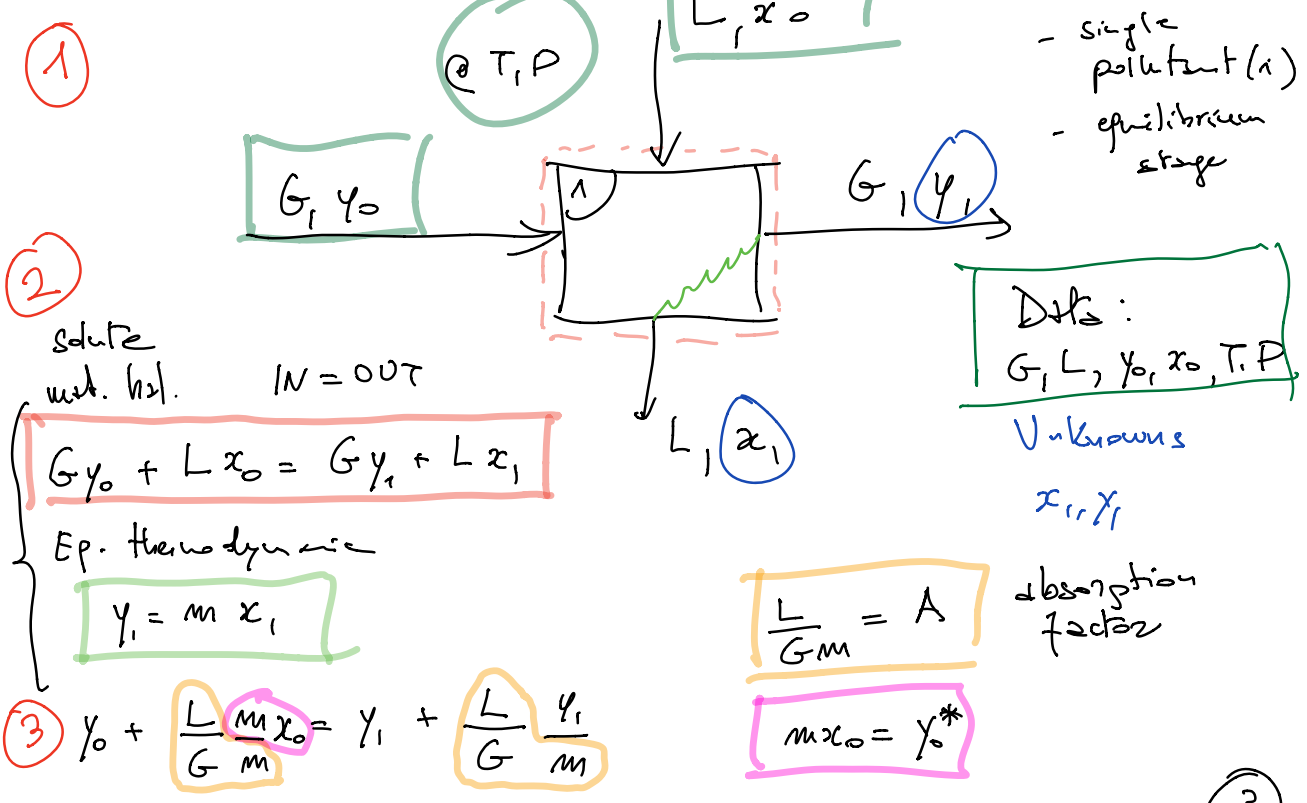
$x_2 \rightarrow 1 \rightarrow \gamma_2 \rightarrow 1$

Pitzer equation

(2)



Absorption



$$y_i = \frac{y_0 + A y_0^*}{1 + A}$$

$$x_i = \frac{y_i}{m}$$

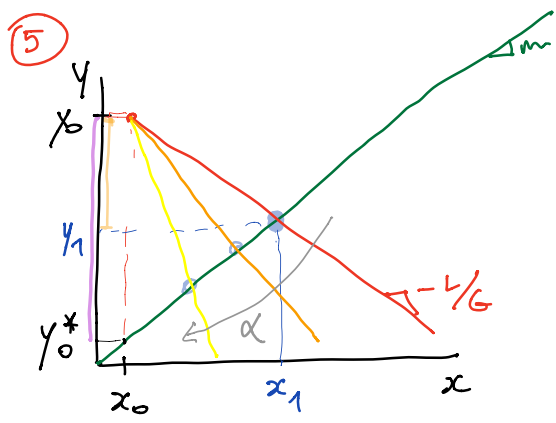
$A \rightarrow 0 \quad y_i \rightarrow y_0$
 $A \rightarrow \infty \quad y_i \rightarrow y_0^*$

④ fraction of absorption
absorption efficiency

$$\alpha = \frac{\text{amount absorbed}}{\text{max. amount absorbable}} = \frac{y_0 - y_i}{y_0 - y_0^*}$$

$$\alpha = 1 - \frac{1}{1 + A}$$

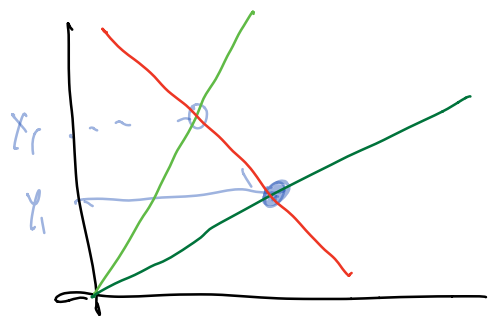
key performance indicator KPI



$y = mx$ equilibrium line
 $y = -\frac{L}{G}x + (y_0 + \frac{L}{G}x_0)$ operating line

solvent (W) $\rightarrow H_W \rightarrow m_W$
 solvent (Z) $\rightarrow H_Z \rightarrow m_Z$
 $m_W < m_Z$

@ T, P which solvent is better?



just why?
 higher P
 lower T