Blatt 12 PC I

(45) a) $1228\ cm^3$

b) $617.7\ cm^3$

c) $-1.687\ \%$

(46) a) $x_a = x_b = 0.5$

b) $m_{Aceton} / m_{H_2O} = 3.223$

(47) $K_H \approx 630\ bar$

(45) a) $V_{Mischung} = n_a V_{A,m} + n_b \cdot V_{B,m} =$

$= x_A \cdot n\, V_{A,m} + x_b \cdot n \cdot V_{B,m} =$

$= n \left\{ (1 - x_B) \cdot V_{A,m} + x_B \cdot V_{B,m} \right\}$

$$n = \frac{m}{(1-x_B) \cdot m_{A,mol} + x_B \cdot m_{B,mol}} =$$

$$= \frac{2\,000\ g}{(1 - 0.4500) \cdot 100.00\ g/mol + 0.4500 \cdot 85.00\ g/mol} =$$

$= 21.447721\ \text{mol}$

$$V_{\text{Mischung}} = 21.447721\ \text{mol} \cdot \left[(1 - 0.4500) \cdot 55.000\ \frac{\text{cm}^3}{\text{mol}} + 0.4500 \cdot 60.600\ \frac{\text{cm}^3}{\text{mol}} \right]$$

$$= 1227.882027\ \text{cm}^3 = \boxed{1228\ \text{cm}^3}$$

b) $V_A^* = n_A \cdot V_{A,m}^* = 589.8123\ \text{cm}^3 = \boxed{589.8\ \text{cm}^3}$

$V_B^* = n_B \cdot V_{B,m}^* = 617.694336\ \text{cm}^3 = \boxed{617.7\ \text{cm}^3}$

$n_B = x_B \cdot n = 0.4500 \cdot 21.447721\ \text{mol} = 9.651474\ \text{mol}$

$n_A = (1 - x_B) \cdot n = 11.796246\ \text{mol}$

c) $V_{ges}^* = V_A^* + V_B^* = 1207.506636\ \text{cm}^3$

$$\frac{V_{ges}^* - V_{\text{Mischung}}}{V_{ges}^*} = 1 - \frac{V_{\text{Mischung}}}{V_{ges}^*} = -0.0168739$$

$\Rightarrow -1.687\ \%$

(keine Kontraktion
Ausdehnung)

(46) $\Delta S_{\text{Misch}} = -nR \cdot \left(x_A \ln x_A + x_B \cdot \ln x_B \right)$

$$\frac{\partial (\Delta S_{misch})}{\partial x_A} = -nR \cdot \left(1 \cdot \ln x_A + x_A \cdot \frac{1}{x_A} - 1 \cdot \ln(1-x_A) + \right.$$

$$\left. - (1-x_A) \cdot \frac{1}{1-x_A} \right)$$

$$= -nR \cdot \left(\ln x_A + 1 - \ln(1-x_A) - 1 \right)$$

$$= -nR \cdot \ln \frac{x_A}{1-x_A} \stackrel{!}{=} 0$$

$$\ln \frac{x_A}{1-x_A} = 0 \quad \text{für} \quad \frac{x_A}{1-x_A} = 1$$

$$\boxed{x_A = \frac{1}{2}} \qquad \boxed{x_B = 1 - x_A = \frac{1}{2}}$$

b) $$\frac{m_{Azeton}}{m_{H_2O}} = \frac{n_{Azeton} \cdot M_{mol,Azeton}}{n_{H_2O} \cdot M_{mol,H_2O}} =$$

$$= \frac{58.08 \text{ g/mol}}{18.02 \text{ g/mol}} = 3.22308\ldots = \boxed{3.223}$$

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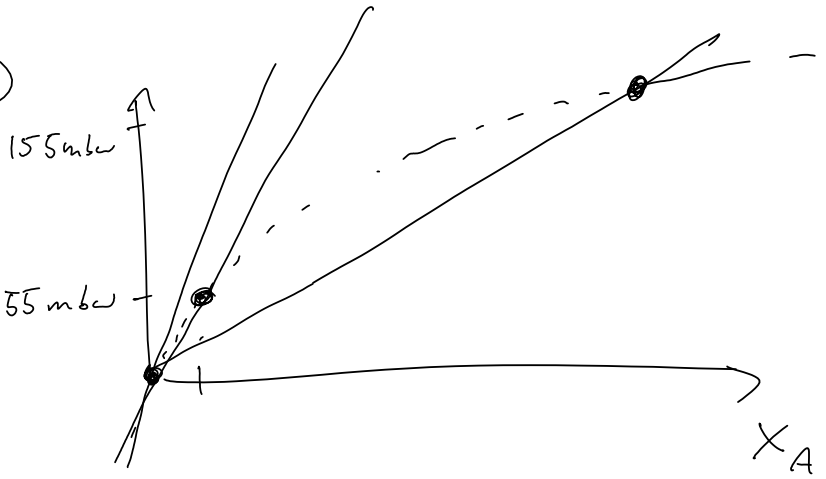

$p = K_H \cdot x_A \qquad$ für $x_A \approx 0$

$$K_H \approx \frac{p}{x_A} = \frac{55.0 \text{ mbar}}{\frac{0.22 \text{ mmol}}{(0.22 \text{ mmol} + 2.50 \text{ mol})}} =$$

$$= 625.0568\ldots \text{ bar} \approx \boxed{6.3 \cdot 10^2 \text{ bar}}$$