

III
14-1

A - benzén
B - toluen

$X_{AF} = 0,35$
 $T = 70^\circ\text{C}$

$\dot{n}_V = 60$
 $\dot{n}_L = 90$

$x_A = ?$
 $y_A = ?$
 $p = ?$

a) numericky

zvloženie $\dot{n}_F = 10 \text{ mol/s} \Rightarrow \dot{n}_V = 6 \text{ mol/s} \ \& \ \dot{n}_L = 4 \text{ mol/s}$

bilanca A: $0,35 \cdot 10 = y_A \cdot 6 + x_A \cdot 4$

Konováhen - Raoult z.

$\frac{1-y_A}{y_A} = \frac{p_B^\circ(T)}{p_A^\circ(T)} \cdot \frac{1-x_A}{x_A}$

} 2 rovnice
pre neznáme x_A, y_A

Řešení $y_A = 3,5/6 - 4/6 x_A$

$p_B^\circ(273,15+70) = 27,2 \text{ kPa}$
 $p_A^\circ(273,15+70) = 73,4 \text{ kPa}$

$\frac{1 - 3,5/6 + 4/6 x_A}{3,5/6 - 4/6 x_A} = \frac{p_B^\circ(T)}{p_A^\circ(T)} \cdot \frac{1-x_A}{x_A}$

$x_A - 3,5/6 x_A + 4/6 x_A^2 = \left(\frac{p_B^\circ(T)}{p_A^\circ(T)}\right) \cdot (1-x_A) \left(3,5/6 - 4/6 x_A\right)$

$x_A - 3,5/6 x_A + 4/6 x_A^2 = (0,3699) \left(3,5/6 - 4/6 x_A - 3,5/6 x_A + 4/6 x_A^2\right)$

$2,5/6 x_A + 4/6 x_A^2 = 0,3699 \left(3,5/6 - 7,5/6 x_A + 4/6 x_A^2\right)$

$0,8790 x_A + 0,42 x_A^2 - 0,2158 = 0$

$D = b^2 - 4ac = 0,879^2 - 4 \cdot 0,42 \cdot (-0,2158) = 1,135$

$\sqrt{D} = 1,0655$

$x_A = \frac{-b \pm \sqrt{D}}{2a} = \frac{-0,879 \pm 1,0655}{2 \cdot 0,42} = \begin{cases} x_A = 0,2220 \\ x_A = -2,31 \end{cases}$

$y_A = \frac{3,5}{6} - \frac{4}{6} \cdot 0,222 = 0,4353$

$p \cdot y_A = p_A^\circ(T) x_A \Rightarrow p = 73,4 \cdot \frac{0,222}{0,4353} = 37,43 \text{ kPa}$

OTOC

b) graficky

pracovní směs $F = [0,35; 0,35]$

Směrnice $-\frac{n_L}{n_V} = -\frac{40}{60} = -\frac{2}{3}$

konstanta

$$\frac{1}{\gamma_A} = \frac{p_B^{\circ}(T)}{p_A^{\circ}(T)} \frac{1-x_A}{x_A} + 1$$

$$p_A^{\circ} = 73,43 \text{ kPa}$$

$$p_B^{\circ} = 27,16 \text{ kPa}$$

volíme $x_A \rightarrow$ dopočítáme γ_A

x_A	γ_A
0,1	0,231
0,20	0,4033
0,21	0,418
0,22	0,4326
0,3	0,537
0,23	0,447

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$$\left(\frac{n_L}{n_V} + 1\right) Y_{AF}$$

POC. PĚMKA

POHODLINA

$$X_A = 0,22\% = 0,2225$$
$$y_A = 0,435$$

SAMICE

$$\frac{n_L}{n_V} = \frac{40,2}{50,3}$$

POHODLINA

$\tau = 702$

y_A

0,5

0,4

0,3

0,2

0,1

0,1

0,2

0,3

0,4

X_A

X_{AF}