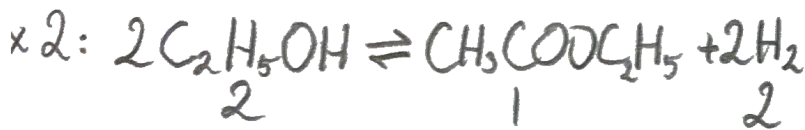
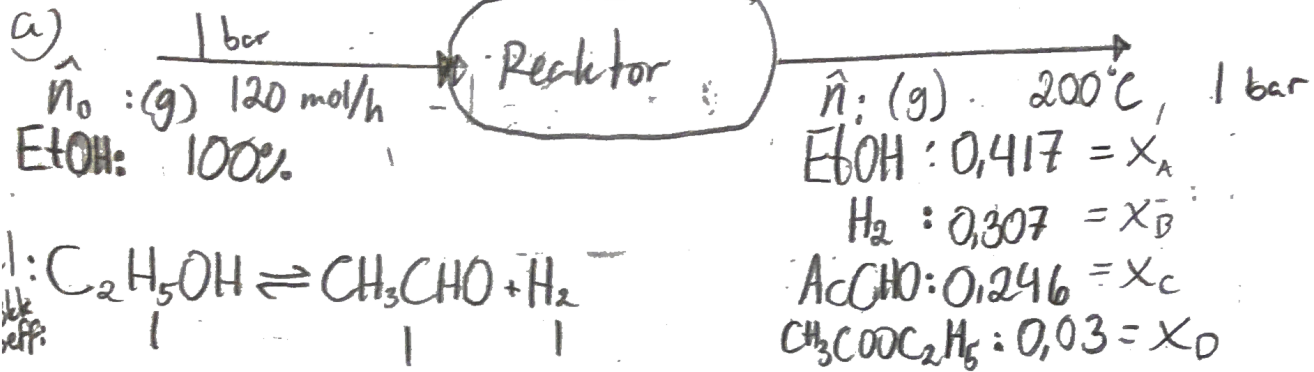


Øving 5 - Prosessteknikk

Oppgave 1



Produktfordeling (B-D finnes ikke i feedstrøm)

$$\hat{n}_A = \hat{n}_{A,0} + \xi_1 V_A^1 + \xi_2 V_A^2 = 120 - \xi_1 - 2\xi_2 \quad (1)$$

$$\hat{n}_B = \xi_1 V_B^1 + \xi_2 V_B^2 = \xi_1 + 2\xi_2 \quad (2)$$

$$\hat{n}_C = \xi_1 V_C^1 + \xi_2 V_C^2 = \xi_1 \quad (3)$$

$$\hat{n}_D = \xi_1 V_D^1 + \xi_2 V_D^2 = \xi_2 \quad (4)$$

For å slippe
skrivning:
EtOH = A
 $H_2 = B$
AcCHO = C
 $CH_3COOC_2H_5 = D$

Oppdeling: $\hat{n}_{tot} = \hat{n}_{A,0} + \xi_1 + 2\xi_2$

$$X_A = \frac{\hat{n}_{A,0} - \xi_1 - 2\xi_2}{\hat{n}_{tot}} \Rightarrow 0,417 = \frac{120 - \xi_1 - 2\xi_2}{120 + \xi_1 + \xi_2} \quad (5)$$

$$X_B = \frac{\xi_1 + 2\xi_2}{\hat{n}_{tot}} \Rightarrow 0,307 = \frac{\xi_1 + 2\xi_2}{120 + \xi_1 + \xi_2} \quad (6)$$

$$X_C = \frac{\xi_1}{\hat{n}_{tot}} \Rightarrow 0,246 = \frac{\xi_1}{120 + \xi_1 + \xi_2} \quad (7)$$

$$X_D = \frac{\xi_2}{\hat{n}_{tot}} \Rightarrow 0,03 = \frac{\xi_2}{120 + \xi_1 + \xi_2} \quad (8)$$

Har 4 likninger med 2 ukjente, velger (7) og (8)
og løser for dem

$$0,246 = \frac{E_1}{120 + E_1 + E_2}$$

$$0,03 = \frac{E_2}{120 + E_1 + E_2}$$

$$0,246(120 + E_1 + E_2) = E_1$$

$$E_2 = \frac{3,6 + 0,03 E_1}{0,97}$$

$$E_1 = \frac{(120 + E_2)0,246}{1 - 0,246}$$

$$E_1 = \frac{29,52 + 0,246 E_2}{0,754}$$

(Burde ikke sett inn tall så tidlig)

(8) Inn i (7)

$$E_1 = \frac{29,52 + 0,246 \frac{3,6 + 0,03 E_1}{0,97}}{0,754}$$

løser, får $E_1 = 40,77 \text{ (mol/h)}$

Setter inn $E_1 = 40,77$ i (8), får: $E_2 = 4,97 \text{ (mol/h)}$

Produktfordeling, beregnet: (fra produktfordeling)

Hver	mengde i produktstrøm (mol/h)
EtOH	69,29
H ₂	50,71
CH ₃ CHO	40,77
CH ₃ COOC ₂ H ₅	4,97
Totalt: $\hat{n}$	165,74

Total molstrøm ut: $\hat{n} = 165,74 \text{ mol/h}$

$$b) \quad y = \frac{40,77}{40,77 + 24,97} = \underline{\underline{0,804}}$$

$$c) \quad \text{Vet at } K_2 = \frac{a_D a_B^2}{a_A^2} = 2,37 \text{ ved likevekt.}$$

Vårt tilfelle: (Antar ideell gass)

$$Q = \frac{a_D a_B^2}{a_A^2}$$

$$Q = \frac{x_D x_B^2}{x_A^2} = \frac{0,03 \cdot 0,307^2}{0,417^2}$$

$$Q = 0,016$$

$$a_i = \frac{p_i}{p^0}$$

$$p_{\text{tot}} = 1 \text{ bar}$$

$$p_i = x_i \cdot p_{\text{tot}}$$

$$\Downarrow$$

$$a_i = \frac{x_i \cdot p_{\text{tot}}}{p^0}$$

$$p_{\text{tot}} = 1 \text{ bar} = p^0$$

$$a_i = x_i$$

Vi får at $Q < K_2 \Rightarrow$ likevekten er venstreforskyvet, så det er OK!

Mengden etylacetat overstiger ikke mengden ved likevekt.