

12/04-2012

1)

A → 3B

$$q = 0,01$$

$$X_A = 0,9$$

$$C_p = 4 \text{ kJ/kgK}$$

$$\rho = 9000 \text{ kg/m}^3$$

$$\Delta H = -100 \text{ kJ/mol A omsatt}$$

$$C_A^0 = 1 \text{ kmol/m}^3$$

$$\text{UTVEKSLAT VÆRME} = (F_A^0 X_A) \cdot (-\Delta H)$$

$$= -(0,01 \cdot 1 \cdot 0,9) \cdot 10^3 \cdot (-100) / 10^3 = 0,9 \cdot 10^6 \text{ J}$$

$$q \rho C_p (\Delta T) = 0,01 \cdot 9000 \cdot 4 \cdot 10^3 (\Delta T) = 36 \cdot 10^3 \Delta T$$

$$= 36 \cdot 10^3 \Delta T \Rightarrow$$

$$\Delta T = 25 \Rightarrow$$

$$T_{\text{ut}} = 50^\circ \text{C}$$

UPPG 2

120412

$$k_d(100) \Rightarrow \text{ur } N = N^0 e^{-k_d t}$$

$$k_d(100) = 0,0764 \text{ s}^{-1}$$

$$\text{PSS } k_d(120) = 0,2595 \text{ s}^{-1}$$

$$A) \quad N = \frac{N^0}{(1+k_d \tau)} \Rightarrow \frac{N}{N^0} = \frac{1}{(1+0,26 \cdot 600)} =$$

$$0,00637 \Rightarrow 0,64\% \text{ kvar}$$

$$B) \quad k_d = k_d^0 e^{-E_d/RT}$$

$$\frac{k(100)}{k(120)} = e^{-\frac{E_d}{R} \left[ \frac{1}{373,15} - \frac{1}{393,15} \right]} \Rightarrow$$

$$E_d = 74,55 \cdot 10^3 \text{ J/mol}$$

C)

ANZAHL  
( $5 \cdot 10^5$ )

$$\frac{N_0}{N} = 5 \cdot 10^5$$

$$N = N_0 / (1 + k_d T) = \frac{1}{5 \cdot 10^5} \Rightarrow$$

$$k_d T \approx 5 \cdot 10^5 \Rightarrow k_d = 833,3$$

$$k_d = k_d^0 e^{-E_d / RT} \Rightarrow (100^\circ\text{C}) \quad k_d^0 = 2,05 \cdot 10^9$$

$$\Rightarrow T = 609,2 \text{ K} \Rightarrow 336,05^\circ\text{C}$$

D)

TUB  $N = N^0 e^{-k_d T}$

$$N = N^0 e^{-0,26600} \Rightarrow$$

$$\frac{N}{N^0} = 2,34 \cdot 10^{-68}$$

H A)

uttrycken

$$Y_{P/S} = 0,4^2 - 0,02 / 20 = 0,2 \frac{9}{9} \left| \frac{3,8}{286} / 20 / 30 = 0,214 \right. \frac{\text{mol}}{\text{mol}}$$

$$Y_{P/S} = 10 / 20 = 0,5 \frac{9}{9} \left| \frac{10}{22} / \frac{20}{30} = 0,682 \right.$$

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$\mu_{\max}$  beräknas ur

$$N = N^0 e^{\mu t}$$

$N^0$  känd

$t$  2 tider  $\Rightarrow \mu_{\max}$   
tidst

$k_s$  får bestämmas vid senare tid

$$5) \quad S^e = 8 \text{ g/a}$$

$$\rightarrow \boxed{Y_{X/S} = 0,25 \text{ g/g}} \rightarrow$$

$$\frac{q_x}{\mu} = 0,3 \frac{S}{(0,1+S)} \cdot X \quad D = 0,15$$

$$D = \mu \quad (X^e = 0) \Rightarrow 0,15 = 0,3 \cdot \frac{S}{(0,1+S)} \Rightarrow$$

$$S = 0,1$$

$$X = X^e + Y_{X/S} (8 - 0,1) = 1,975 \text{ g}$$

$$Y_{X/S} = 0,25 \text{ g/g} \Rightarrow 0,3036 \frac{\text{mol}}{\text{mol}} \Rightarrow$$

$$Y_{\text{CO}_2} (\text{REK RESP}) = 1 - 0,3036 = 0,6964 \frac{\text{mol}}{\text{mol}}$$

$$M_x = 24,7, \quad M_s = 30, \quad M_{\text{CO}_2} = 44$$

$$Y_{\text{CO}_2} = 0,6964 \frac{\text{mol}}{\text{mol}} = 1,02 \text{ g/g} \Rightarrow$$

$$\text{CO}_2(\text{ur}) = 1,02 (7,9) = 8,058 \text{ g}$$

$$F_{\text{CO}_2} \Rightarrow DX = 0,15 \cdot 1,975 = 0,296 \frac{\text{g}}{\text{h}}$$

$$D\text{CO}_2 = 0,15 \cdot 8,058 = 1,21 \text{ g/h}$$

$$\text{MAX } X \Rightarrow DX (\text{OPT})$$

$$DX = \text{Max} \frac{S}{(k_1 + S)} \cdot X = \text{Max} \frac{S}{(k_1 + S)} \cdot Y_{1S} (S^0 - S)$$

$$\frac{dDX}{dS} = 0 \Rightarrow$$

$$(S^0 - 2S)(k_1 + S) - (S S^0 - S^2) = 0$$

Facts  $\longrightarrow$

$$(S + k_s)^2 = k_s^2 + s^0 k_s$$

$$S^2 + (2k_s)S - s^0 k_s = 0$$

$$S = -\frac{2k_s}{2} \pm \sqrt{k_s^2 + s^0 k_s}$$

$$S = -k_s \pm \sqrt{k_s^2 + s^0 k_s}$$

$$= -0,1 \pm \sqrt{0,1^2 + 8 \cdot 0,1} = 0,8$$

0,9

$$x = 0,22(8 - 0,8) = 1,584 \quad 9/2$$

$$D = 1,3 \frac{0,8}{(0,1 + 0,8)} = 0,267 \quad \frac{1}{h}$$

$$Dx = 0,422 \quad \frac{9}{2h}$$


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test

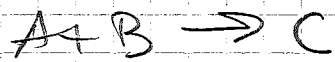
$$S = 0,7 \Rightarrow \begin{cases} x = 1,606 \\ D = 0,2825 \end{cases}$$

$$\left. \begin{cases} x_D = 0,42152 < \underline{0,4} \end{cases} \right\}$$

$$S = 0,9 \Rightarrow \begin{cases} x = 1,562 \\ D = 0,27 \end{cases}$$

$$\left. \begin{cases} Dx = 0,4217 < \underline{0,4} \end{cases} \right\}$$

6)



$$X_A = 30\%$$

INBEN RECHNUNG

ANTAG 100 MOL FÄHIG

$$F_A^{UT} = F_A^0 (1 - X_A^R) = 50 (1 - 0,3) = 35 = 41,7\%$$

$$F_B^{UT} = F_B^0 - F_A^0 X_A = 35 - 0,3 \cdot 50 = 20 = 23,5\%$$

$$F_C^{UT} = F_C^0 + F_A^0 X_A = 15 = 17,6\%$$

$$F_I^{UT} = F_I^{IN} = 15 = 17,6\%$$

25% AV ORBÄGERAD A RECHNUNG

ANTAG X MOL

MB

$$(X + 50) \cdot 0,7 \cdot 0,25 = X$$

$$\Rightarrow X = \underline{10,60}$$

$$UT = (10,6 + 50) \cdot 0,7$$

$$\text{PRODUKT FLÖDE} \quad 0,75 \cdot 0,7 (10,6 + 50) = 31,815$$

$$\Rightarrow X^{SYST} = 0,3636 \quad \text{dvs } 36,36\%$$

$$F_B^{UT} = 35 - 50 \cdot 0,3636 = 16,82$$

$$F_C^{UT} = 18,18 \quad F_I^{UT} = 15$$



B ÄR BEGRÄNSANDE REAKTANT

$$F_B^{IN} = 35 \text{ mol/s}$$

$$\text{MAX REAGERAD MÄND A} = 35 = (50+X) \cdot 0,3$$

$$\Rightarrow X = \frac{35}{0,3} - 50 = 66,67$$

$\Rightarrow$  MÄND REC % AV UTPLODE

$$X = (X + 50) \cdot 0,7 \cdot \% \Rightarrow \% = 0,816$$

$$\Rightarrow \text{dvs } 81,6 \%$$

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