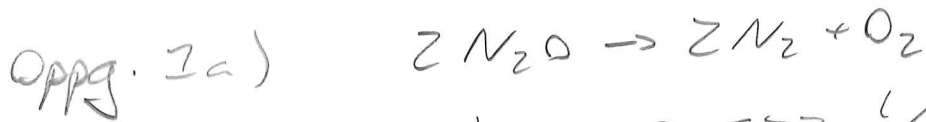


Rekthek, Øving 2 Vegard G. Jøvell



$$K_{N_2O} = 0,977 \text{ l/mol}\cdot\text{s}$$

$$X = 0,9$$

$$I) \quad r_{N_2O} = K_{N_2O} C_{N_2O}^2$$

$$II) \quad -r_{N_2O} = \frac{dC_{N_2O}}{dt} = \frac{d}{dt} (C_0^{N_2O} (1-X)) = -C_0^{N_2O} \frac{dX}{dt}$$

$$I = II)$$

$$K_{N_2O} C_{N_2O}^2 dt = C_0^{N_2O} dX$$

$$K_{N_2O} dt = \frac{C_0^{N_2O}}{(C_0^{N_2O} (1-X))^2} dX$$

$$K_{N_2O} t = \frac{1}{C_0^{N_2O}} \int_0^{0,9} \frac{dX}{(1-X)^2} = \frac{1}{C_0^{N_2O}} \int_1^{0,1} \frac{du}{u^2} = \frac{1}{C_0^{N_2O}} \left(1 - \frac{1}{0,1}\right)$$

$$t = \frac{9}{K_{N_2O} C_0^{N_2O}}, \quad C_0^{N_2O} = \frac{1P_0}{RT_0} = 0,01 \frac{\text{mol}}{\text{L}}$$

$$\underline{\underline{t = 15 \text{ min}}}$$

Oppg. 2B)

$$I) \quad r_{N_2O} = k_{N_2O} C_{N_2O}^2$$

$$II) \quad C_{N_2O} = \frac{n_{N_2O}}{V_T}$$

$$n_T = C_T V_T, \quad n_{T_0} = C_{T_0} V_{T_0}, \quad C = \frac{P}{RT}$$

$$III) \quad V_T = V_{T_0} \frac{n_T T_{P_0}}{n_{T_0} T_0 P} = V_{T_0} \frac{n_T}{n_{T_0}}$$

$$IV) \quad n_T = n_A + n_B + n_C = n_{T_0} + n_{A_0} \left(-1 + 1 + \frac{1}{2}\right) X_A, \quad A = N_2O$$

$$IV \rightarrow III: V) \quad V_T = V_{T_0} \left(1 + \frac{n_{A_0} X_A}{n_{T_0} \cdot 2}\right), \quad \frac{n_{A_0}}{n_{T_0}} = 1$$

$$V \rightarrow II: VI) \quad C_{N_2O} = \frac{n_{N_2O}}{V_{T_0} \left(1 + \frac{1}{2} X_{N_2O}\right)} = \frac{n_0^{N_2O} (1 - X_{N_2O})}{V_{T_0} \left(1 + \frac{1}{2} X_{N_2O}\right)}$$

$$VII) \quad C_{N_2O} = C_0^{N_2O} \frac{1 - X_{N_2O}}{1 + \frac{1}{2} X_{N_2O}}$$

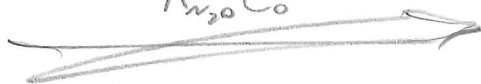
$$VIII) \quad -r_{N_2O} = \frac{dC_{N_2O}}{dt} = -C_0^{N_2O} \frac{dX}{dt}$$

$$VII = I) \quad \frac{k_{N_2O}}{C_0^{N_2O}} dt = \frac{dX}{C_{N_2O}^2}$$

$$\frac{k_{N_2O}}{C_0^{N_2O}} t = \frac{1}{C_0^2} \int_0^{0.9} \left(\frac{1 + \frac{1}{2} X_{N_2O}}{1 - X_{N_2O}} \right)^2 dX = \left[\frac{3}{2} \ln(1-X) + \frac{1}{4} X + \frac{9}{4} \frac{X}{1-X} \right] \Big|_0^{0.9}$$

$$\frac{k_{N_2O}}{C_0^{N_2O}} t = 17 \frac{1}{C_0^{N_2O}}$$

$$t = \frac{17}{k_{N_2O} C_0^{N_2O}} = 29 \text{ min}$$



Oppg. 1c)

$$I) r_A = F_{A0} \frac{dX}{dV}$$

$$II) r_A = k_A C_A^2, \quad C_A = C_{A0} \frac{1-X_A}{1+\frac{1}{2}X_A}$$

$$I = II) k_A C_A^2 dV = -F_{A0} dX$$

$$dV = \frac{-F_{A0}}{k_A C_{A0}^2} \left(\frac{1+\frac{1}{2}X_A}{1-X_A} \right)^2 dX$$

$$V = \frac{F_{A0}}{k_A C_{A0}^2} \left[\frac{3}{2} \ln(1-X) + \frac{1}{4}X + \frac{9X}{4(1-X)} \right]_{X=0,9}$$

$$V = 2700 \text{ l} = 2,9 \text{ m}^3$$

Oppg. 1d)

$$I) -r_A = \frac{F_A - F_{A0}}{V} = \frac{-F_{A0} X_A}{V}$$

$$II) r_A = k_A C_A^2, \quad C_A = C_{A0} \frac{1-X_A}{1+\frac{1}{2}X_A}$$

$$I = II) k_A C_A^2 = \frac{F_{A0} X_A}{V}$$

$$V = \frac{F_{A0} X_A}{k_A C_{A0}^2} \left(\frac{1+\frac{1}{2}X_A}{1-X_A} \right)^2$$

$$V = 32280 \text{ l} \approx 32,3 \text{ m}^3$$
