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TCM6 - TD - Corrigé

* Uniquement s'il s'agit d'un examen.

Application directe du cours

Ex 1

1. RCPA $\rightarrow$ $P_{th} = -hS(T - T_0)$ (<0 car le réacteur cède de la chaleur)

2. $P_{th} = P_\varphi + P_x$

$$P_x = \Delta_r H^\circ \frac{d\xi}{dt} = \Delta_r H^\circ \underbrace{v V}_{\text{bilan matière}} = \Delta_r H^\circ D_v \alpha C_0$$

bilan matière

$$P_\varphi = \frac{C_p}{dt}(T_s - T_e) = D_v \rho_{eau} c_{p_{eau}} (T_s - T_e)$$

$$\Rightarrow P_{th} = D_v \Delta_r H^\circ C_0 \alpha + D_v \rho_{eau} c_{p_{eau}} (T_s - T_e)$$

3. $T_s = 35°C$

S'entraîner

Ex 1

1. RCPA $\rightarrow$ $D_v \alpha [AcOEt]^e = vV = k[AcOEt][HO^-]V$

$$\Rightarrow D_v \alpha [AcOEt]^e = k[AcOEt]^e(1-\alpha)\left([HO^-]^e - \alpha [AcOEt]^e\right)V$$

$$\Rightarrow D_v \alpha C_0 = k\frac{C_0}{2}(1-\alpha)\left(2\frac{C_0}{2} - \alpha\frac{C_0}{2}\right)V$$

$$\Rightarrow D_v \alpha = k\frac{C_0}{4}(1-\alpha)(2-\alpha)V$$

$$\Rightarrow \alpha = 88{,}1\%$$

$$\boxed{\begin{array}{l} D^S_v = 2D_v \\ [AcOEt]^S = \frac{C_0}{2}(1-\alpha) \\ [HO^-]^S = \frac{C_0}{2}(2-\alpha) \end{array}}$$

2. $P_{th} = P_\varphi + P_x = -hS\Delta T_{sup}$

$$P_\varphi = 2D_v \rho_{eau}^* c_{p_{eau}}^* (T_s - T_{e,HO^-}) + 2D_v \rho_{eau} c_{p_{eau}} \times (T_s - T_{e,AcOEt})$$

$$P_x = \Delta_r H^\circ v V = \Delta_r H^\circ k \frac{C_0^2}{4}(1-\alpha)(2-\alpha)V$$

$$\Rightarrow S = 0{,}0296 \text{ m}^2$$

N° .../...

Ex2

1. bilan de matière $D_v C^0_{I_1} dt - D_v C^0_{I_1}(1-\alpha)dt - v V dt = 0$

$\Rightarrow D_v \alpha C^0_{I_1} = k V [I_1] = k V C^0_{I_1}(1-\alpha)$

$\Rightarrow V = \dfrac{D_v \alpha}{k(1-\alpha)} = \dfrac{145 \times 0{,}9}{2{,}61 \times 10^{14} e^{\left(\frac{-14570}{160+273}\right)} \times 0{,}1} = 2053\ L = 2{,}05\ m^3$

2. $P_{tR} = P_\varphi + P_x$

$P_{tR} = R I^2$

$P_\varphi = C_p \times (T_s - T_e) = D_v \times C^0_{I_1} C_{pm} (T_s - T_e) = D_v \dfrac{e_m}{M} C_{pm} (T_s - T_e)$

$P_x = \Delta_r H^0\, v V = \Delta_r H^0 D_v \alpha C^0_{I_1} = \Delta_r H^0 D_v \alpha \dfrac{e_m}{M}$

$\Rightarrow R = D_v \times \dfrac{e_m}{M} \left(C_{pm}(T_s - T_e) + \Delta_r H^0 \alpha \right) \times \dfrac{1}{I^2}$

$= \dfrac{145 \times 0{,}9}{0{,}250} \left(520(160-20) + 86{,}7 \times 10^3 \times 0{,}9 \right) \times \dfrac{1}{1^2}$

$R = 78{,}7\ M\Omega$ pour $R = 21{,}9\ k\Omega$

N° .../...