

Oppg. 12a)  $i = Fk^0 \left[ C_R \exp\left(\frac{(1-\alpha)F}{RT}(E-E^0)\right) - C_O \exp\left(\frac{\alpha F}{RT}(E-E^0)\right) \right]$

$E^0 = 0,28V$

$E = E^0 - \frac{RT}{F} \ln\left(\frac{C_R}{C_O}\right) = E^0, C_R = C_O$

$E = 0,28V$

$i_n = Fk^0 C_R^\alpha C_O^{1-\alpha} \rightarrow k^0 = \frac{i_n}{F C_R^\alpha C_O^{1-\alpha}}$

$k^0 = 1 \cdot 10^{-5} \frac{A}{m^2 s}$

12b) Anodish Tafel-slope =  $\alpha_{ox} \frac{F}{RT}$

Katodish Tafel-slope =  $\alpha_{rd} \frac{F}{RT}$

hver  $\alpha_{ox} = \frac{RT}{F} \frac{\partial \ln|i|}{\partial E} \Big|_{i \approx i_{ox}}$  og  $\alpha_{rd} = \frac{RT}{F} \frac{\partial \ln|i|}{\partial E} \Big|_{i \approx i_{rd}}$

$\ln|i| = \ln(i_n) \left( \underbrace{\frac{-\alpha F}{RT}(E-E_n)}_{i_{ox}} + \underbrace{\frac{(1-\alpha)F}{RT}(E-E_n)}_{i_{rd}} \right)$

$\frac{\partial \ln|i|}{\partial E} \Big|_{i \approx i_{ox}} = \ln(i_n) \frac{-\alpha F}{RT}, \quad \frac{\partial \ln|i|}{\partial E} \Big|_{i \approx i_{rd}} = \ln(i_n) \frac{(1-\alpha)F}{RT}$

$\alpha_{ox} = -\alpha \ln(i_n), \quad \alpha_{rd} = (1-\alpha) \ln(i_n)$

Anodish Tafel slope = 121

Katodish Tafel slope = -121

Oppg. 12c)  $i = i_n \left[ \frac{C_R^s}{C_R^b} \exp\left(\frac{(1-\alpha)F}{RT} (E - E_n)\right) - \frac{C_O^s}{C_O^b} \exp\left(\frac{-\alpha F}{RT} (E - E_n)\right) \right]$

$$\left. \begin{array}{l} E - E_n = 50 \text{ mV} \\ C_R^s = C_R^b \\ C_O^s = C_O^b \end{array} \right\} \begin{array}{l} i = 4,5 \text{ mA/cm}^2 \text{ med hele Butler-Volmer} \\ i = 5,3 \text{ mA/cm}^2 \text{ med Tafel approx} \end{array}$$

12d)

$$E - E_n = 200 \text{ mV} \rightarrow \begin{array}{l} i = 98 \text{ mA/cm}^2 \text{ med hele Butler-Volmer} \\ i = 98 \text{ mA/cm}^2 \text{ med Tafel approx} \end{array}$$

12e)  $E - E_n = -200 \text{ mV}$

$$\begin{array}{l} i = -98 \text{ mA/cm}^2, \text{ ved Tafel approximation} \\ \text{setter } i_{ox} \approx 0 \text{ n\u00e5r } E - E_n \ll 0 \\ \text{og } i_{red} \approx 0 \text{ n\u00e5r } E - E_n \gg 0 \end{array}$$

12f) se vedlegg elektro-py10.py

12g) se vedlegg elektro-py2.py