

TD 4 Propriétés électriques des solutions

300

Exo 1

1° Calculer la résistivité

$$\left\{ \begin{array}{l} \rho = \frac{1}{\chi} ; \chi = ? \\ \lambda = \frac{\chi}{C_{eq}} \Rightarrow \left\{ \begin{array}{l} \chi = \lambda \cdot C_{eq} \\ \lambda = \alpha \lambda_0 \end{array} \right. ; C_{eq} = ? \end{array} \right. \Rightarrow \rho = \frac{1}{\lambda \cdot C_{eq}}$$



$C_{eq} = 4 \alpha m_0 = 4 \alpha \frac{C_p}{M} = 4 \cdot 3 \cdot \frac{142 \text{ g/l}}{142 \text{ g/mol}} = 4 \cdot 10^{-3} \text{ eq/l}$

$C_{eq} = 4 \text{ eq.g/m}^3$

$\lambda = \alpha \lambda_0 = \alpha (\lambda^+ + \lambda^-) = 3 \cdot (5 + 16) \cdot 10^{-3} \text{ m}^2 \text{ eq}^{-1} \text{ s}^{-1}$

$\lambda = 2,1 \cdot 10^{-3} \text{ m}^2 \text{ eq}^{-1} \text{ s}^{-1}$

a et b) $\Rightarrow \rho = \frac{1}{\lambda C_{eq}} = \frac{1}{2,1 \cdot 10^{-3} \cdot 4}$

$\rho = 119 \text{ } \Omega \cdot \text{m}$

exo 2

• Coefficient $\alpha = ?$

$$\begin{cases} \lambda = \alpha \lambda_0 & \Rightarrow \alpha = \frac{\lambda}{\lambda_0} \\ \lambda = \frac{x}{c_{eq}} \\ \lambda_0 = \lambda^+ + \lambda^- \end{cases} \Rightarrow \alpha = \frac{x}{c_{eq}} \cdot \frac{1}{\lambda_0} = \frac{x}{c_{eq}} \cdot \frac{1}{(\lambda^+ + \lambda^-)}$$

$c_{eq} = 2 \alpha m_r$

$$\alpha = \frac{x}{2 \alpha m_r \cdot \lambda_0} \Rightarrow \alpha^2 = \frac{x}{2 m_r \cdot (\lambda^+ + \lambda^-)}$$

$$\alpha = \sqrt{\frac{x}{2 m_r \cdot (\lambda^+ + \lambda^-)}} = \sqrt{\frac{3,6 \cdot 10^{-4} \text{ mol/L}}{2 \cdot 0,1 \cdot 10^{-3} \text{ mol/L} \cdot (73,4 + 198,5)}}$$

?

$$\alpha = 0,08$$

• Constante de dissociation $K = ?$

$K = ?$

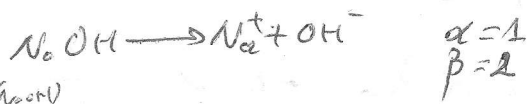
$$K = \frac{[\text{NH}_4^+][\text{OH}^-]}{[\text{NH}_4\text{OH}]} = \frac{\alpha m_r \cdot \alpha m_r}{(1-\alpha)m_r} = \frac{\alpha^2 m_r}{1-\alpha}$$

$$= \frac{(8 \cdot 10^{-2})^2 \cdot 0,1}{(1 - 8 \cdot 10^{-2})} \Rightarrow K = 6,4 \cdot 10^{-4}$$

EX 4

$$pH = 14 + \log [NaOH] = 14 + \log m_{NaOH}$$

$$m_{NaOH} = ?$$



$$C_{eq} = 2m_{NaOH} \quad / \quad m_{NaOH} = \frac{C_{eq} \nu_{NaOH}}{2} \quad \chi_{NaOH} = ?$$

$$\lambda = \frac{\chi}{C_{eq}} \Rightarrow C_{eq} = \frac{\chi_{NaOH}}{\lambda_{NaOH}} = ?$$

$$\lambda = \lambda_0 = \lambda^+ + \lambda^- = (50,1 + 198,5) = 248,6 \text{ cm}^2 \cdot \text{eq}^{-1}$$

$$\chi_{NaOH} = ?$$

$$\Leftrightarrow R_{KCl} = \rho_{KCl} \frac{l}{S} \quad / \quad R_{NaOH} = \rho_{NaOH} \frac{l}{S} \quad \left(\frac{l}{S} = A \text{ m\u00eame pour les 2 solutions} \right)$$

$$R_{KCl} = \frac{1}{\chi_{KCl}} \cdot \frac{l}{S} \quad \frac{l}{S} = \frac{R_{KCl}}{\rho_{KCl}} \Rightarrow R_{NaOH} = R_{NaOH} = \frac{1}{\chi_{NaOH}} \cdot \frac{l}{S}$$

$$\frac{l}{S} = R_{KCl} \chi_{KCl} = R_{NaOH} \chi_{NaOH} = \frac{l}{S}$$

$$\Rightarrow \chi_{NaOH} = \frac{R_{KCl} \cdot \chi_{KCl}}{R_{NaOH}} = \frac{4 \cdot 10^{-2} \cdot 210}{300} = 0,028 \text{ mol} \cdot \text{cm}^{-3}$$

$$C_{eq} = \frac{218 \cdot 10^{-2} \text{ mol} \cdot \text{cm}^{-3}}{248,6 \text{ cm}^2 \cdot \text{eq}^{-1}} = 0,01126 \cdot 10^{-2} \text{ eq/L} = 0,1126 \text{ eq/L}$$

$$m_{NaOH} = \frac{0,1126}{2} = 5,63 \cdot 10^{-2} \text{ mol/L}$$

$$pH = 14 + \log(5,63 \cdot 10^{-2}) = 14 - 2 \log 10 + \log(5,63) = 14 - 2 \times 1 + 0,75$$

pH = 12,75