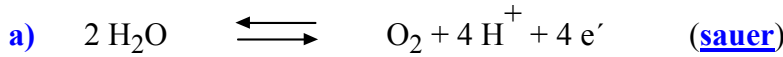


Spannung der Sauerstoff-Elektrode



$$U_{\text{O}_2} = U_{\text{O}_2}^0 + \frac{R \cdot T}{z \cdot F} \cdot \ln \frac{p_{\text{O}_2} \cdot a_{\text{H}^+}^4}{a_{\text{H}_2\text{O}}^2}$$

$$U_{\text{O}_2}^0 = \frac{\Delta G_{B,ox}^0 - \Delta G_{B,red}^0}{z \cdot F} = \frac{4(\Delta G_{B,H^+}^0) + \Delta G_{B,O_2}^0 - 2(\Delta G_{B,H_2O}^0)}{4 \cdot F} = \frac{(0 + 113,38) \text{ kcal} \cdot \text{mol} \cdot V}{4 \cdot 23,05 \text{ kcal} \cdot \text{mol}}$$

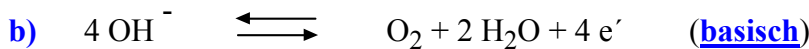
$$U_{\text{O}_2}^0 = 1,2297 \text{ V} \sim 1,23 \text{ V}_H \quad \left(\Delta G_{\text{sauer}}^0 = 113,38 \frac{\text{kcal}}{\text{mol}} \right)$$

$$U_{\text{O}_2} = 1,23 \text{ V} + \frac{0,059 \text{ V}}{4} \cdot \log \frac{p_{\text{O}_2} \cdot a_{\text{H}^+}^4}{a_{\text{H}_2\text{O}}^2} \quad / a_{\text{H}_2\text{O}} = 1$$

$$U_{\text{O}_2} = 1,23 \text{ V} + \left(\frac{0,059 \text{ V}}{4} \cdot \log p_{\text{O}_2} \right) + \left(\frac{0,059 \text{ V}}{4} \cdot \log a_{\text{H}^+}^4 \right)$$

mit $p_{\text{O}_2} = 1 \text{ bar}$ und $pH = -\log a_{\text{H}^+}$ folgt

$$U_{\text{O}_2} \approx 1,23 \text{ V} - 0,059 \text{ V} \cdot pH = \text{EMK}$$



$$U_{\text{O}_2} = U_{\text{O}_2}^0 + \frac{R \cdot T}{z \cdot F} \cdot \ln \frac{p_{\text{O}_2} \cdot a_{\text{H}_2\text{O}}^2}{4 a_{\text{OH}^-}^4}$$

$$U_{\text{O}_2}^0 = \frac{\Delta G_{B,ox}^0 - \Delta G_{B,red}^0}{z \cdot F} = \frac{\Delta G_{B,O_2}^0 + 2(\Delta G_{B,H_2O}^0) - 4(\Delta G_{B,OH^-}^0)}{4 \cdot F} = \frac{(0 - 113,38 + 150,38) \text{ kcal} \cdot \text{mol} \cdot V}{4 \cdot 23,05 \text{ kcal} \cdot \text{mol}}$$

$$U_{\text{O}_2}^0 = 0,401 \text{ V}_H \quad \left(\Delta G_{\text{bas.}}^0 = 37 \frac{\text{kcal}}{\text{mol}} \right)$$

$$U_{\text{O}_2} = 0,401 \text{ V} + \frac{0,059 \text{ V}}{4} \cdot \log \frac{p_{\text{O}_2} \cdot a_{\text{H}_2\text{O}}^2}{a_{\text{OH}^-}^4} \quad / a_{\text{H}_2\text{O}} = 1, p_{\text{O}_2} = 1 \text{ bar}$$

$$U_{\text{O}_2} = 0,401 \text{ V} + \frac{0,059 \text{ V}}{4} \cdot \log a_{\text{OH}^-}^{-4} = 0,401 \text{ V} + \frac{0,059 \text{ V} \cdot (-4)}{4} \cdot \log a_{\text{OH}^-} \quad / \log a_{\text{OH}^-} = -14 + pH$$

$$U_{\text{O}_2} = 0,401 \text{ V} - 0,059 \text{ V} \log a_{\text{OH}^-} = 0,401 \text{ V} - 0,059 \text{ V} \cdot (-14 + pH)$$

$$U_{\text{O}_2} = 0,401 \text{ V} + 0,826 \text{ V} - 0,059 \text{ V} \cdot pH = 1,227 - 0,059 \text{ V} \cdot pH$$

$$U_{\text{O}_2} \approx 1,23 \text{ V} - 0,059 \text{ V} \cdot pH = \text{EMK}$$

ΔG_B^0 -Werte in kcal/mol: $\Delta G_{B,H^+}^0 = \Delta G_{B,O_2}^0 = 0$, $\Delta G_{B,OH^-}^0 = -37,595$, $\Delta G_{B,H_2O}^0 = -56,69$