



5.3.4 电极电势的应用

判断氧化还原反应进行的程度

天津大学

邱海霞



判断氧化还原反应进行的程度

$$\left. \begin{array}{l} \Delta_r G_m^\ominus = -2.303RT \lg K^\ominus \\ \Delta_r G_m^\ominus = -zFE_{MF}^\ominus \end{array} \right\} \longrightarrow 2.303RT \lg K^\ominus = zFE_{MF}^\ominus$$

$$T=298.15 \text{ K}$$

$$R=8.314 \text{ J}\cdot\text{mol}^{-1}\cdot\text{K}^{-1}$$

$$F=96485 \text{ C}\cdot\text{mol}^{-1}$$

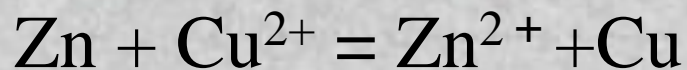
$$\lg K^\ominus = \frac{zFE_{MF}^\ominus}{2.303RT}$$

$$\lg K^\ominus = \frac{zE_{MF}^\ominus}{0.0592} = \frac{z(E_+^\ominus - E_-^\ominus)}{0.0592}$$



例题

求下列反应在298.15 K时的标准平衡常数 K^{\ominus}



$$E^{\ominus}(\text{Cu}^{2+}/\text{Cu}) = 0.340\text{V} \quad E^{\ominus}(\text{Zn}^{2+}/\text{Zn}) = -0.7626\text{V}$$

$$z=2$$

$$E_{\text{MF}}^{\ominus} = E_{+}^{\ominus} - E_{-}^{\ominus} = 0.340 + 0.7626 = 1.103\text{V}$$

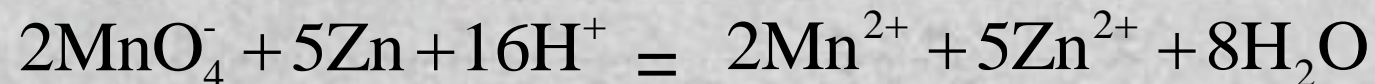
$$\lg K^{\ominus} = \frac{zE_{\text{MF}}^{\ominus}}{0.0592} = \frac{2 \times 1.103}{0.0592} = 37.26$$

$$K^{\ominus} = 1.8 \times 10^{37}$$



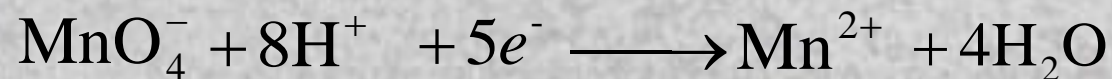
例题

求下列反应在298 K时的平衡常数 K



$$E^\ominus(\text{MnO}_4^-/\text{Mn}^{2+}) = 1.51\text{V} \quad E^\ominus(\text{Zn}^{2+}/\text{Zn}) = -0.7626\text{V}$$

$$E_{\text{MF}}^\ominus = E_+^\ominus - E_-^\ominus = 1.51 - (-0.7626) = 2.27\text{V}$$



$$\lg K^\ominus = \frac{zE_{\text{MF}}^\ominus}{0.0592} = \frac{10 \times 2.27}{0.0592} = 383.45$$

$$K^\ominus = 2.8 \times 10^{383}$$