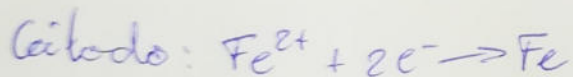


2006 Castilla-La Mancha 83
(CNH_3) mín para reducir todo el Fe^{2+})

Plantamos ecuación de la pila:



$$E^\circ_{\text{Pila}} = E^\circ_{\text{cat}} - E^\circ_{\text{an}} = -0,44 + 0,40 = -0,04 \text{ V}$$

$$E_{\text{Pila}} = E^\circ_{\text{Pila}} - \frac{0,059}{n} \log \frac{[\text{Cd}^{2+}]}{[\text{Fe}^{2+}]}$$

Para que la reacción suceda es necesario que $E_{\text{Pila}} > 0$, luego:

$$E^\circ_{\text{P}} - \frac{0,059}{n} \log \frac{[\text{Cd}^{2+}]}{[\text{Fe}^{2+}]} > 0 \rightarrow \frac{[\text{Cd}^{2+}]}{[\text{Fe}^{2+}]} < 10^{\frac{nE^\circ_{\text{P}}}{0,059}}$$

$$\left[\begin{array}{l} [\text{Cd}^{2+}]_f < 10^{\frac{nE^\circ_{\text{P}}}{0,059}} \cdot [\text{Fe}^{2+}]_f \\ \text{Donde } [\text{Fe}^{2+}]_f = 10^{-3} [\text{Fe}^{2+}]_0 \end{array} \right] \rightarrow [\text{Cd}^{2+}]_f < 10^{\frac{-2 \cdot 0,04}{0,059}} \cdot 10^{-3} \cdot 0,01$$

$$[\text{Cd}^{2+}]_f < 4,4 \cdot 10^{-7} \text{ M} \quad (\text{concentración máxima de } \text{Cd}^{2+} \text{ libre})$$

$$K_d = \frac{[\text{Cd}^{2+}][\text{NH}_3]^4}{[\text{Cd}(\text{NH}_3)_4^{2+}]} \rightarrow [\text{NH}_3] = \sqrt[4]{\frac{K_d [\text{Cd}(\text{NH}_3)_4^{2+}]}{[\text{Cd}^{2+}]}}$$

$$\text{Donde } [\text{Cd}(\text{NH}_3)_4^{2+}] \approx [\text{Cd}^{2+}]_{\text{total}} \approx [\text{Cd}^{2+}]_0 + [\text{Fe}^{2+}]_0 \approx 0,02 \text{ M}$$

$$[\text{NH}_3] = \sqrt[4]{\frac{2,5 \cdot 10^{-7} \cdot 0,02}{4,4 \cdot 10^{-7}}} = 0,326 \text{ M}$$

$$[\text{NH}_3]_{\text{T}} = [\text{NH}_3] + \overset{\rightarrow 0}{[\text{NH}_4^+]} + 4[\text{Cd}(\text{NH}_3)_4^{2+}] = 0,326 + 4 \cdot 0,02 = \boxed{0,406 \text{ M}}$$