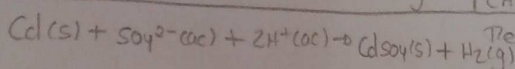
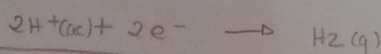
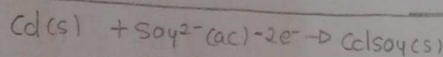
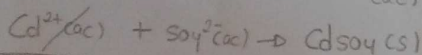
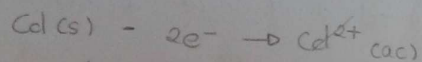


Para la pila  $\text{Cd} / \text{CdSO}_4(\text{s}) // \text{H}_2\text{SO}_4(0.02\text{M}) / \text{H}_2(1\text{atm}) / \text{Pt}$ , se conocen los siguientes datos: potencial a  $35^\circ\text{C}$   $E_{\text{Cd}^{2+}/\text{Cd}} = 0.38\text{V}$ , a  $35^\circ\text{C}$   $E_{\text{H}^+/\text{H}_2} = 0.00\text{V}$  se pide:

- La solubilidad de  $\text{Cd}^{2+}$  en la  $\text{H}_2\text{SO}_4$   $0.02\text{M}$ .
- $K_{\text{ps}}$  para el  $\text{CdSO}_4$  a  $35^\circ\text{C}$ .

Planteo la pila:



$$T = 35^\circ\text{C} = 308\text{K}$$

$$E^\circ = 0.45\text{V}$$

$$\text{Cd}|\text{Cd}^{2+}$$

ANODO  
oxidación

Electrodo formado por metal y sal insoluble del metal

CÁTODO

$$E_{\text{H}^+/\text{H}_2}^\circ = 0.00\text{V} \text{ a } T = 35^\circ\text{C}$$

Reducción

$$E_{\text{pila}} = 0.38\text{V}$$

$$E = E^\circ - \frac{RT}{nF} \log \frac{P_{\text{H}_2}}{[\text{H}^+]^2} \Rightarrow E_{\text{cátodo}} = 0.00 - \frac{8.314 \cdot 308 \cdot 2.303}{2 \cdot 96500} \log \frac{1}{(0.04)^2}$$

de reducción

$$E_{\text{cátodo}} = -0.085\text{V}$$

$$E_{\text{pila}} = E_{\text{cátodo}} - E_{\text{ánodo}} \Rightarrow E_{\text{ánodo}} = E_{\text{cátodo}} - E_{\text{pila}}$$

$$\Rightarrow E_{\text{ánodo}} = -0.085 - 0.38 = -0.465\text{V}$$

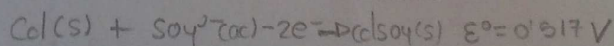
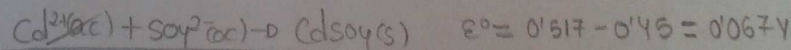
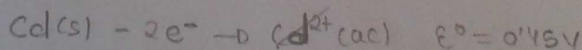
de reducción

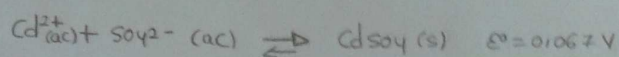
$$E_{\text{ánodo}} = E_{\text{ánodo}}^\circ - \frac{RT}{nF} \log \frac{1}{[\text{SO}_4^{2-}]} \Rightarrow E_{\text{ánodo}}^\circ = -0.465 + \frac{8.314 \cdot 308 \cdot 2.303}{2 \cdot 96500} \log \frac{1}{0.02}$$

$$\Rightarrow E_{\text{ánodo}}^\circ = 0.517\text{V}$$

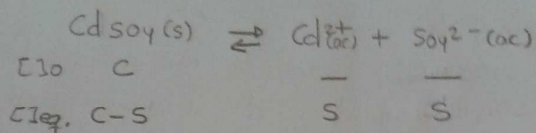
de oxidación

Entonces para:





$$E = E^0 - \frac{R \cdot T \cdot 2.303}{n \cdot F} \cdot \log \frac{1}{[\text{Cd}^{2+}] \cdot [\text{SO}_4^{2-}]}$$



$$K_{ps} = [\text{Cd}^{2+}] \cdot [\text{SO}_4^{2-}] \quad , \quad K_{ps} = s^2 \Rightarrow s = \sqrt{K_{ps}}$$

En el equilibrio  $\Delta G = 0 \Rightarrow E = 0$  ya que  $\Delta G = -n \cdot F \cdot E$

$$0 = 0.1067 - \frac{8.314 \cdot 308 \cdot 2.303}{2 \cdot 96500} \cdot \log \frac{1}{K_{ps}} \Rightarrow 2.193 = \log 1 - \log K_{ps} \Rightarrow$$

$$\Rightarrow K_{ps} = 10^{-2.193}$$

$$\Rightarrow K_{ps} = 6.41 \cdot 10^{-3}$$

a T = 35°C

$$s = \sqrt{6.41 \cdot 10^{-3}} \Rightarrow s = 0.0801$$

solubilidad del  $\text{Cd}^{2+}$  en la disolución de  $\text{H}_2\text{SO}_4$  0.2M:

$$a) \quad K_{ps} = [\text{Cd}^{2+}] \cdot [\text{SO}_4^{2-}] \Rightarrow [\text{Cd}^{2+}] = \frac{6.41 \cdot 10^{-3}}{0.02} \Rightarrow$$

$$\Rightarrow [\text{Cd}^{2+}] = 0.32 \text{ M}$$

a 35°C

$$0.32 \frac{\text{mol Cd}^{2+}}{\text{L}} \cdot \frac{1 \text{ mol CdSO}_4}{1 \text{ mol Cd}^{2+}} \cdot \frac{208 \text{ g CdSO}_4}{1 \text{ mol CdSO}_4} = 66.56 \frac{\text{g CdSO}_4}{\text{L}}$$

66.56 g CdSO4 / 100 mL

El esquema de la pila (considerando que sobra lo del puente salino) sería:

