

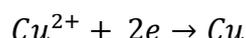
Answer on the question #55702 - Chemistry - Physical Chemistry

Question:

the standard reduction potential for Cu^{2+}/Cu is +0.34V. calculate the reduction potential at $\text{pH}=14$ for the above couple. $K_{sp} \text{Cu}(\text{OH})_2$ is $1.0 \cdot 10^{-19}$

Solution:

Let's write the reaction of reduction, taking place in the half-cell.



According to the Nernst equation, the half cell potential is:

$$\varphi = \varphi^0 + \frac{RT}{nF} \ln[\text{Cu}^{2+}]$$

K_{sp} for $\text{Cu}(\text{OH})_2$ is equal to:

$$K_{sp} = [\text{Cu}^{2+}][\text{OH}]^2$$

At $\text{pH}=14$, the concentration of $[\text{OH}]$ is 1 M. Then, the concentration of $[\text{Cu}^{2+}]$ is:

$$[\text{Cu}^{2+}] = \frac{K_{sp}}{1^2} = 1.0 \cdot 10^{-19} \text{ M}$$

Then, the potential of the half-cell is:

$$\varphi = 0.34 + \frac{0.0591}{2} \log(1.0 \cdot 10^{-19}) = -0.22 \text{ V}$$

Answer: -0.22 V