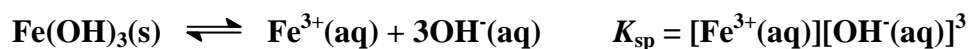


- The K_{sp} of $\text{Fe}(\text{OH})_3$ is $2.0 \times 10^{-39} \text{ M}^4$. What is the solubility of $\text{Fe}(\text{OH})_3$ in g L^{-1} ?

The solubility equilibrium and constant for the dissolution of $\text{Fe}(\text{OH})_3$ are:



If S moles of $\text{Fe}(\text{OH})_3$ dissolve, S mol of $\text{Fe}^{3+}(\text{aq})$ and $3S$ mol of $\text{OH}^{-}(\text{aq})$ are formed. Thus,

$$K_{sp} = (S) \times (3S)^3 = 27S^4 = 2.0 \times 10^{-39}$$

$$S = 9.3 \times 10^{-11} \text{ M}$$

The formula mass of $\text{Fe}(\text{OH})_3$ is $(55.85 (\text{Fe}) + 3 \times (16.00 (\text{O}) + 1.008 (\text{H}))) \text{ g mol}^{-1} = 106.874 \text{ g mol}^{-1}$. Thus, as $9.3 \times 10^{-11} \text{ mol}$ dissolves in 1.0 L, the mass which dissolves in 1.0 L is:

$$\begin{aligned} \text{mass} &= \text{number of moles} \times \text{formula mass} \\ &= (9.3 \times 10^{-11} \text{ mol}) \times 106.874 \text{ g mol}^{-1} = 9.9 \times 10^{-9} \text{ g} \end{aligned}$$

Answer: $9.9 \times 10^{-9} \text{ g L}^{-1}$

What effect does lowering the pH have on the solubility of $\text{Fe}(\text{OH})_3$? Explain your answer.

The equilibrium for the reaction:



lies to the left. Addition of H^{+} removes the OH^{-} and hence, from Le Chatelier's principle more $\text{Fe}(\text{OH})_3(\text{s})$ will dissolve.

Hence, lowering the pH will increase the solubility.