

Solubility Equilibria

Dissolution process is largely a thermodynamic process

Can be described as an equilibrium!

- What energy is required to get AB(s) into solution ($A^+ + B^-$)?
- The larger the energy requirement, the less soluble a material will be.

The extent to which a material dissolves is described by an equilibrium constant, K_{sp}

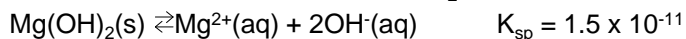


- *In order for these equilibria to be valid, some undissolved solid must be present!*
- These equilibria are useful in predicting solubility

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Solubility Equilibria

Example: Calculate the solubility of $\text{Mg}(\text{OH})_2$ in moles per liter.



Example. If the concentration of strontium ion is $2.5 \times 10^{-4} \text{M}$, does precipitation of SrSO_4 occur when enough of the soluble salt Na_2SO_4 is added to make the solution $2.5 \times 10^{-4} \text{M}$ in SO_4^{2-} ? K_{sp} for SrSO_4 is 2.8×10^{-7} .

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Factors Influencing Solubility

- Since solubility is an equilibrium process, all the things that affect equilibria also affect solubility!
 - Temperature, Le Chatelier's principle, etc.

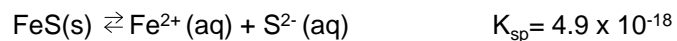
Example. Calculate the solubility for $\text{Zn}(\text{CN})_2$ in (1) pure water, and (2) in the presence of 0.10 M KCN. The K_{sp} for $\text{Zn}(\text{CN})_2$ is 8.0×10^{-12} .

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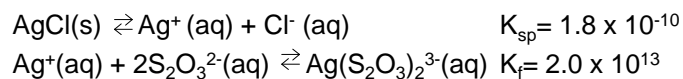
Factors Influencing Solubility

Other considerations: Remember Le Chatelier's Principle!

- **pH considerations:** Remember all the equilibria that are involved. How is the solubility of FeS affected by lowering the pH from 7.00 (pure water) to 1.00?



- **Complexation Considerations:** Many species (ligands) form soluble (and insoluble) complexes with metal ions.



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