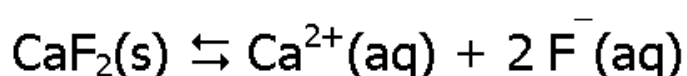
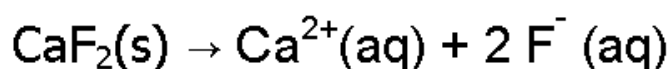


Solubility Equilibria

- Deals with heterogeneous systems
 - Specifically precipitation & dissociation of ionic precipitates
- Examples:
 - Tooth decay—acid reacts with enamel on teeth
 - Gall stones
 - Kidney stones
 - Limestone caves—formation of stalagmites & stalactites
 - Water on Earth has salts in it
- Solubility rules give qualitative view of if compound will dissolve
- Solubility equilibria is quantitative prediction @ amount compound that will dissolve
- REMEMBER: saturated solution—solution is in contact w/ undissolved solute



At equilibrium there is some solid. More solid means more surface area exposed to solvent—doesn't mean greater solubility. When ions reform solid they do so on the surface of the solid. Doubling the surface area of solid will double rate of dissolving and doubles rate of re-forming solid.

Size of particles nor amt. excess solid will cause shift in equilibrium position.

Solubility is an equilibrium position

- Amount of solid that dissolves to produce a saturated solution
- grams of solute/L of solution or mol of solute/L of solution (molar solubility)
 - each salt has a given solubility

Equilibrium equation describes dissolution of solid

Equilibrium constant indicates how soluble solid is in water at a specific temperature; also called the *solubility product constant* or *solubility constant*

(K_{sp})

Don't include solids in equil. expression

K_{sp} value let's know how much of solid will dissolve in water.

$$K_{sp} = [\text{Ca}^{2+}][\text{F}^{-}]^2$$

Sample Problems:

1. Copper I bromide has a measured solubility of 2.0×10^{-4} mol/L at 25°C. Calculate K_{sp} .

2. Calculate K_{sp} for Bi_2S_3 which has a solubility of 1.0×10^{-15} mol/L at 25°C .

2. Calculate the solubility of copper II iodate ($\text{Cu}(\text{IO}_3)_2$) if its K_{sp} value is 1.4×10^{-7} at 25°C .

4. A silver chromate solution is analyzed and the silver ion concentration is 1.3×10^{-4} M. Calculate K_{sp} .

5. K_{sp} for calcium fluoride is 3.9×10^{-11} at 25°C . It dissociates completely and no other equilibria are affecting solubility. Calculate the solubility of the calcium fluoride in grams per liter.

6. The pH of a saturated magnesium hydroxide solution is 10.17. Assuming magnesium hydroxide dissociates completely and no other ions are involved, calculate the K_{sp} .