

LAB 13: SOLUBILITY PRODUCT CONSTANT



Goals

1. Learn of solubility product constants
2. Estimate a solubility constant
3. Observe that a solubility constant is a special case of an equilibrium constant

Materials and Equipment

Reagents:

0.1 M calcium nitrate, $\text{Ca}(\text{NO}_3)_2$

0.1 M sodium oxalate, $\text{Na}_2\text{C}_2\text{O}_4$

Pipet, mini

Toothpick, plastic

Reaction plate, 96 well

Materials Not Included

A sheet of black paper

Distilled water

Introduction

Ionic compounds, such as salts, dissociate to form ions when they dissolve in water. An example is sodium chloride:



Solid NaCl dissociates to become Na^+ and Cl^- ions. The Na^+ cations are attracted to the negative "ends" of water molecules, and the Cl^- anions are attracted to the positive "ends" of water molecules.

In other compounds the attraction between the cations and the anions is stronger, and there is little dissociation. These are sparingly or slightly soluble salts. An example is silver chloride, AgCl . A beaker of this solution often has solid AgCl crystals in the bottom. The crystals are

in equilibrium with the Ag^+ and Cl^- ions that are in the solution:



In this reaction, the rate of AgCl dissolving is equal to the rate of Ag^+ and Cl^- ions combining to form solid AgCl . In other words, the reaction is going both ways at the same time and at the same rate. It is said to be in equilibrium. The equilibrium constant is:

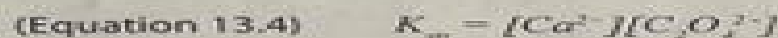


$\text{AgCl}(s)$ is not considered in the equilibrium constant because it is a solid.

We call this special equilibrium constant the solubility product constant, K_{sp} .

Some of the beautiful structures you may have seen in caves are composed of sparingly soluble calcium carbonate. This material slightly dissolves in water, and later precipitates when the water in the solution evaporates or the solution cools.

Another sparingly soluble salt is calcium oxalate, which sometimes precipitates in our kidneys as kidney stones. These can be very painful and often require medical treatment. We will study calcium oxalate, CaC_2O_4 , in this experiment. The solubility product constant for this is:



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