Silver chloride, AgCl, is a white crystalline solid which is well known for its low solubility in water. AgCl occurs naturally as the mineral chlorargyrite. Silver chloride converts to silver and chlorine, when subjected to sunlight or heating.

AgCl adopts the fcc NaCl structure, in which Ag\(^+\) ions are surrounded by octahedrons of six chloride ligands.

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**Chemistry**

AgCl dissolves in solutions containing chloride, cyanide, thiosulfate, or ammonium ions by forming complexes according to the following equations:

\[
\text{AgCl(s)} + \text{Cl}^-(aq) \rightarrow \text{AgCl}_2^-(aq) \\
\text{AgCl(s)} + 2\text{CN}^-(aq) \rightarrow \text{Ag(CN)}_2^-(aq) + \text{Cl}^-(aq) \\
\text{AgCl(s)} + 2\text{S}_2\text{O}_3^{2-} (aq) \rightarrow \text{Ag[}((\text{S}_2\text{O}_3)_2)^3^- (aq) + \text{Cl}^-(aq) \\
\text{AgCl(s)} + 2\text{NH}_4\text{OH(aq)} \rightarrow \text{Ag[}((\text{NH}_3)_2)^+ (aq) + \text{Cl}^-(aq) + 2\text{H}_2\text{O}
\]

Due to the low solubility product of silver chloride, AgCl precipitates when a colorless silver nitrate solution is mixed with a colorless sodium chloride solution:

\[
\text{Ag}^+(aq) + \text{Cl}^-(aq) \rightarrow \text{AgCl(s)}
\]

The opaque white precipitate of AgCl quickly darkens on exposure to light. This reaction is a common test for the presence of chloride in a solution. The solubility product, \(K_{sp}\), for AgCl is 1.8 \(10^{-10}\), the solubility of AgCl in water is 1.9 mg/l at room temperature.

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**Usage**

Silver chloride has a multitude of uses, some of them being listed below:

- Photographic paper: silver chloride is reduced by photons to form a latent image (however, normally silver bromide is used for photographic papers)
• Photochromic lenses: silver chloride is used in photochromic lenses (lenses which change their color when hit by sunlight)
• Silver chloride is used as the cathode in seawater-activated batteries (Mg/AgCl cells)
• The silver electrode is a common reference electrode in electrochemistry.
• Stained glass manufacture: silver chloride creates yellow, amber, and brown shades

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