• Most common oxidation state: +3; +2 and +6 also exist. The +3 oxidation state is the most stable.
• M.P. 1857º
• B.P. 2672º
• Density 8.94 g/cm³
• Characteristics: Chromium is a silvery, rather brittle metal. Similar to aluminum, but exhibits several oxidation states.

Aqueous Ammonia

Ammonia reacts with chromium(III) ion to precipitate gray-green chromium(III) hydroxide:

\[
\text{Cr}^{3+}(aq) + 3\text{NH}_3(aq) + 3\text{H}_2\text{O}(l) \rightleftharpoons \text{Cr(OH)}_3(s) + 3\text{NH}_4^+(aq)\]

\(\text{Cr(OH)}_3\) dissolves only to a slight extent in excess ammonia. Boiling the solution causes the chromium(III) hydroxide to reprecipitate.

Sodium Hydroxide

Strong bases such as \(\text{NaOH}\) also precipitate \(\text{Cr(OH)}_3\), but the precipitate dissolves in excess hydroxide.

\[
\text{Cr}^{3+}(aq) + 3\text{OH}^-(aq) \rightleftharpoons \text{Cr(OH)}_3(s)\]
\[
\text{Cr(OH)$_3$(s) + OH}^-(aq) \rightleftharpoons \text{Cr(OH)$_4$}^-(aq) \text{ (green)}
\]

Hydrogen Peroxide

In basic solution, hydrogen peroxide oxidizes \(\text{Cr(III)}\) to \(\text{Cr(VI)}\):

\[
2\text{Cr(OH)$_4$}^-(aq) + 3\text{H}_2\text{O}_2(aq) + 2\text{OH}^-(aq) \rightarrow 2\text{CrO}_4^{2-}(aq) + 8\text{H}_2\text{O}(l)
\]
To confirm the oxidation, addition of $\text{Ba}^{2+}$ solutions precipitate the yellow chromate ion, $\text{CrO}_4^{2-}$, as yellow barium chromate.

No Reaction

$\text{Cl}^-$, $\text{SO}_4^{2-}$