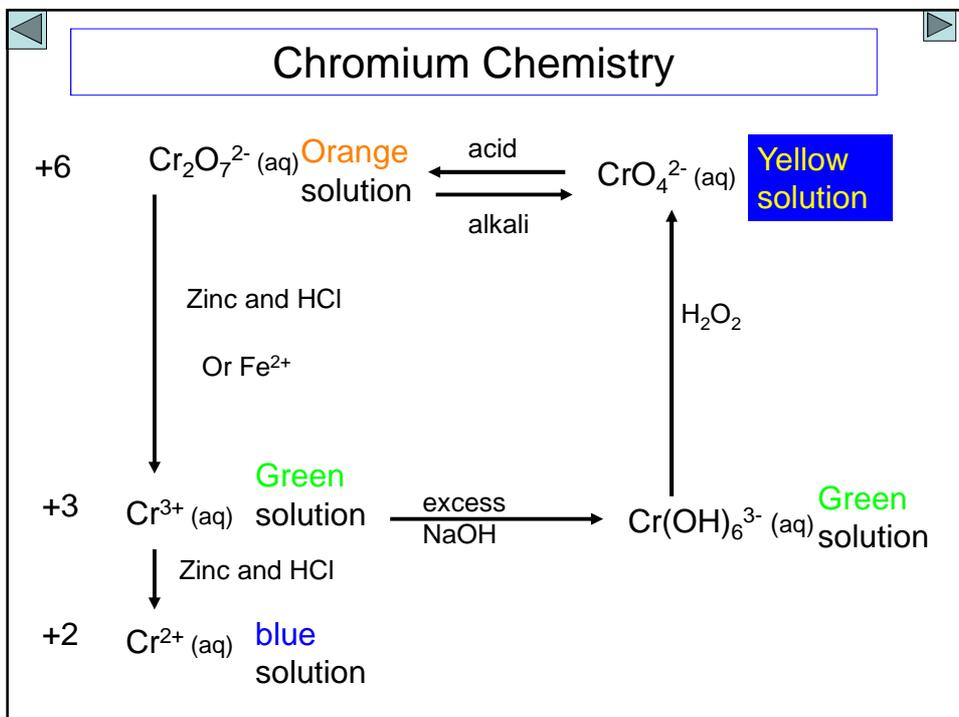


Chromium Chemistry

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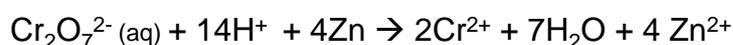
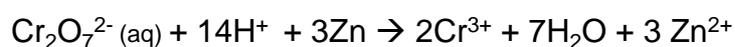


Reducing dichromate with Zinc

Reducing $\text{Cr}_2\text{O}_7^{2-}$ to Cr^{2+}

Zinc metal in HCl will reduce dichromate to Cr^{3+} first and then on to Cr^{2+} . There will be a colour change from orange to green and then blue. Excluding air will help the formation of Cr^{2+} .

Cr^{2+} is unstable and will oxidise back to Cr^{3+} on standing in air

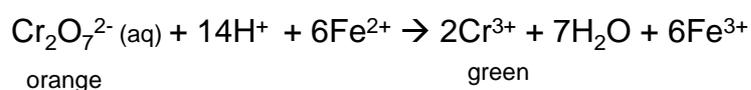
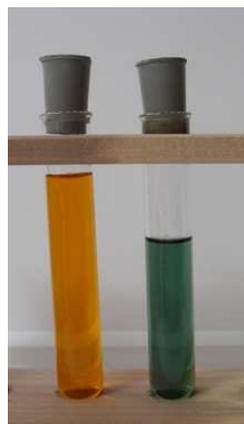


Reducing dichromate with $\text{Fe}^{2+}(\text{aq})$

Reducing $\text{Cr}_2\text{O}_7^{2-}$ to Cr^{3+}

If we want to just reduce the dichromate to Cr^{3+} instead of Cr^{2+} react with **Fe^{2+} ions**. The chromium will **only be reduced** to Cr^{3+} and the Fe^{2+} will be oxidised to Fe^{3+}

There will be a colour change from orange to green. This reaction can be done as a titration (self-indicating).



Reactions of chromium (VI) with acid and alkali

The equilibrium reaction between chromate and dichromate is also caused by the addition of acid or alkali



Yellow
solution

chromate

Orange
solution

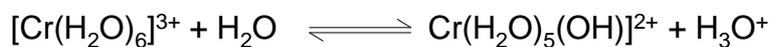
dichromate



Note this is not a redox reaction because the Cr does not change oxidation number.

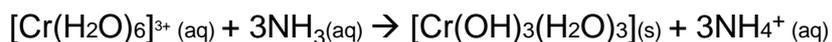
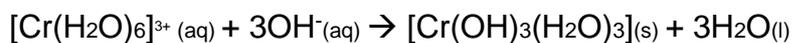
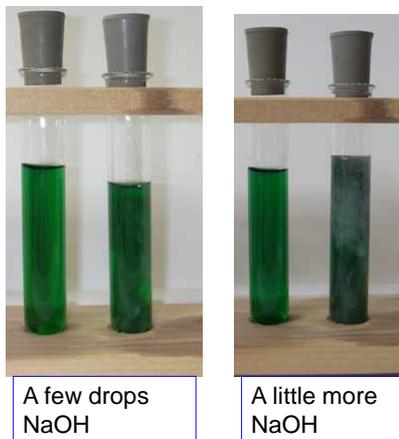
Reactions of the $\text{Cr}^{3+}_{(\text{aq})}$ ion

The $\text{Cr}^{3+}_{(\text{aq})}$ ion is really the complex ion $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}_{(\text{aq})}$. It should appear as a red-blue solution but normally appears green because of hydrolysis reaction below



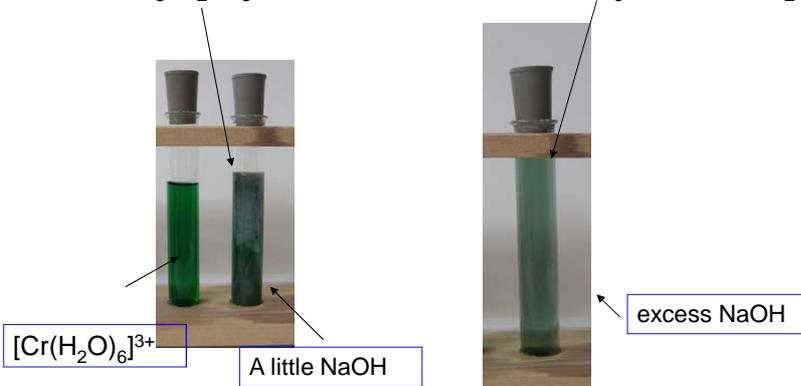
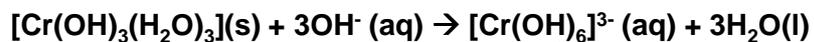
Addition of NaOH and NH₃

1. Addition of **limited amounts of sodium hydroxide or ammonia** to this ion will result in the **green precipitate** of Chromium (III) hydroxide being formed.



Excess NaOH

2. Addition of **excess sodium hydroxide** will result in the green hydroxide precipitate dissolving to form a **green solution**



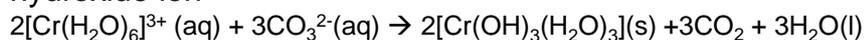
Excess NH₃

Addition of **excess ammonia** will result in the green hydroxide precipitate dissolving to form **a purple solution**



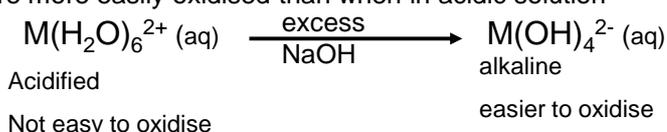
Addition of sodium carbonate

Like other 3⁺ ions the chromium decomposes the carbonate to give carbon dioxide and the **green precipitate** of the hydroxide ion



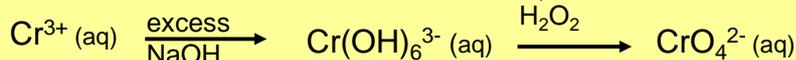
Oxidation in alkaline solution

When transition metals in low oxidation states are in alkaline solution they are more easily oxidised than when in acidic solution

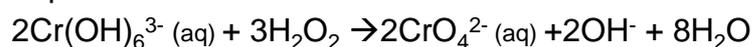


It is easier to remove an electron from a -vely charged ion

Oxidising agent



Full Equation



Half equations

