

Redox chemistry with dichromate ions – teacher notes

Topic

Transition elements – colours of ions, redox reactions, variable oxidation states.

Timing

5 minutes

Description

In this experiment dichromate(VI) ions are reduced to chromate(III) ions by hydrogen peroxide which is itself oxidised to oxygen gas. The experiment provides several points for student observation and illustrates an interesting redox reaction.

Apparatus

- Eye protection
- Student worksheet
- Clear plastic sheet (eg OHP sheet)

Chemicals

Solutions should be contained in plastic pipettes. See the accompanying guidance on apparatus and techniques for microscale chemistry, which includes instructions for preparing a variety of solutions here <https://rsc.li/3T17hyt>

- Potassium dichromate 0.2 mol dm⁻³
- Hydrogen peroxide 5% solution

Observations

On adding the hydrogen peroxide solution, the reaction mixture immediately turns a deep blue colour.

After a while bubbles are seen and the colour gradually fades to a pale blue-green due to hexa-aqua chromium(III) ions.

The reaction is: $\text{Cr}_2\text{O}_7^{2-}(\text{aq}) + \text{H}_2\text{O}_2(\text{aq}) + 8\text{H}^+(\text{aq}) \rightarrow 2\text{Cr}^{3+}(\text{aq}) + 5\text{H}_2\text{O}(\text{l}) + 2\text{O}_2(\text{g})$

Health, safety and technical notes

- Read our standard health and safety guidance here <https://rsc.li/3CBQD2Y>
- Students must wear suitable eye protection (Splash resistant goggles to BS EN1663).
- Potassium dichromate, $\text{K}_2\text{Cr}_2\text{O}_7$, 0.2 mol dm⁻³ is a carcinogen, mutagen, reproductive toxin, skin and respiratory sensitiser. It is also toxic if inhaled, corrosive to skin and eyes and toxic to aquatic life. Wear splash-proof eye-protection if transferring large amounts. Avoid skin contact. See CLEAPSS Hazcard HC078c.
- Hydrogen peroxide, 5% solution H_2O_2 (aq) is of low hazard. See CLEAPSS Hazcard HC050.