

Transition Elements Overview

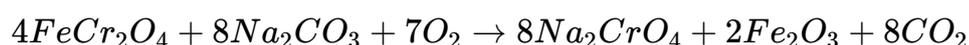
ChatGPT said:



Chemistry of Potassium Dichromate ($K_2Cr_2O_7$)

Preparation:

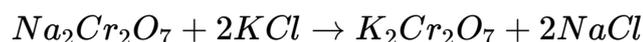
- Potassium dichromate is produced from chromite ore ($FeCr_2O_4$). The process involves the fusion of chromite with sodium carbonate in the presence of oxygen at high temperatures (around $1000^\circ C$). This forms sodium chromate (Na_2CrO_4):



- The sodium chromate solution is acidified using sulfuric acid to convert it into sodium dichromate:



- Potassium dichromate is obtained by treating sodium dichromate with potassium chloride:



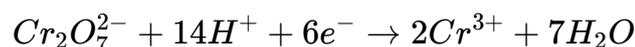
- Potassium dichromate forms orange-red crystals and is less soluble in water than sodium dichromate, making it easier to crystallize.

Physical Properties:

- Potassium dichromate is an orange-red crystalline solid.
- It melts at 671 K and is moderately soluble in cold water, but more soluble in hot water.
- On heating, it decomposes to produce chromium(III) oxide (Cr_2O_3) and oxygen.

Oxidizing Nature:

- Potassium dichromate is a strong oxidizing agent, especially in acidic medium. Its reduction involves the conversion of Cr^{6+} (dichromate) to Cr^{3+} (chromium ion):



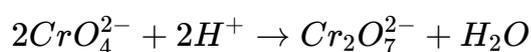
- It can oxidize various substances such as:
 - Iodide to iodine:** $6I^- \rightarrow 3I_2 + 6e^-$
 - Iron(II) to iron(III):** $6Fe^{2+} \rightarrow 6Fe^{3+} + 6e^-$
 - Sulphide to sulphur:** $3S^{2-} \rightarrow 3S + 6e^-$

Uses:

1. **Oxidizing Agent:** Potassium dichromate is widely used in volumetric analysis as a standard oxidizing agent.
2. **Leather Industry:** Used in chrome tanning.
3. **Dyeing and Printing:** In the textile industry for dyeing and printing fabrics.
4. **Analytical Chemistry:** Involved in the quantitative estimation of iron, iodides, and other reducing agents.

Reactions:

- **Acidic Medium:** Potassium dichromate readily oxidizes substances in acidic solutions due to its high redox potential.
- **Interconversion with Chromate:** In aqueous solutions, chromate (CrO_4^{2-}) and dichromate ions ($Cr_2O_7^{2-}$) are interconvertible, depending on the pH of the solution:



- In acidic medium, dichromate is more stable, whereas chromate dominates in alkaline conditions.

This summary highlights the preparation, properties, and uses of potassium dichromate.