

CHEMISTRY STUDY MATERIALS FOR CLASS 12

(NCERT BASED NOTES OF CHAPTER -8)

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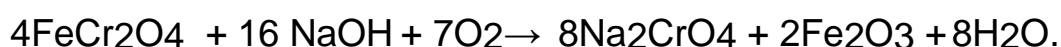
DATE:- 08/08/2021

The d & f - Block Elements

Potassium dichromate, K₂Cr₂O₇:

Preparation: It is prepared from chromite ore or ferro chromes (FeCr₂O₄ or FeOCr₂O₃) by following steps.

- (a) Fusion of the ore with molten alkali in presence of air



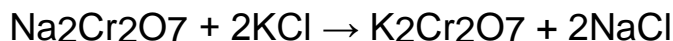
The fused mass is extracted with water and filtered.

- (b) Conversion of sodium chromate into sodium dichromate by treating the filtrate with dil H₂SO₄



Na₂SO₄ being less soluble is separated as Na₂SO₄·10H₂O by fractional crystallization.

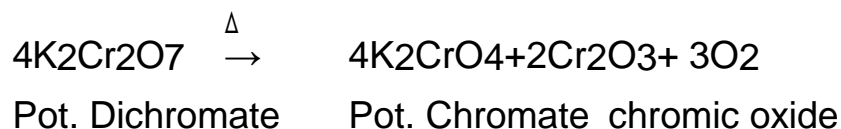
- (c) Conversion of sodium dichromate into potassium dichromate by heating with KCl.



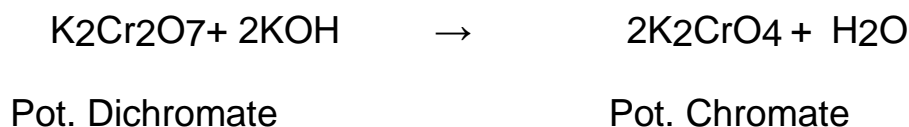
Potassium dichromate being less soluble is obtained by fractional crystallization.

Properties:

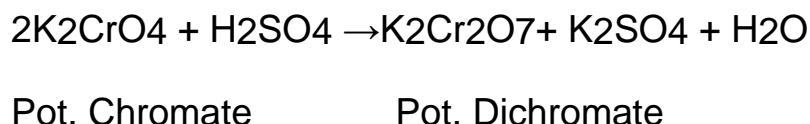
- (i) **Physical state** : Potassium dichromate forms orange red crystals which melts at 669K. It is moderately soluble in cold water but freely soluble in hot water.
- (ii) **Action of heat** : When heated strongly to white heat, it decomposes with the evolution of oxygen.



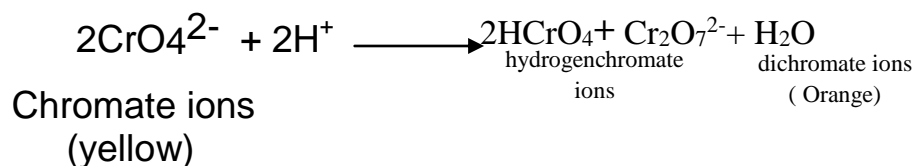
- (iii) **Action of alkalis:** When an alkali is added to an orange red solution containing dichromate ions, a yellow solution is obtained due to the formation of chromate ions. For example,



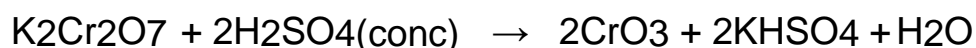
On acidifying the above yellow solution containing chromate ions, it again change to orange red due to the formation of dichromate ions.



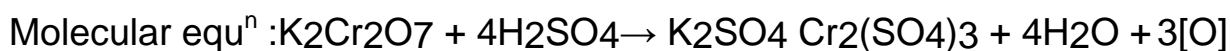
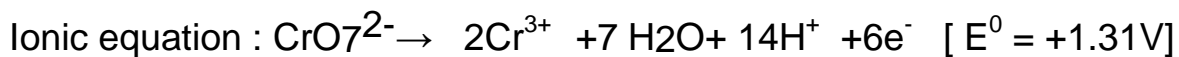
In fact, in any given solution, dichromate ions and chromate ions exist in equilibrium and are interconvertible by altering the pH of the solution.



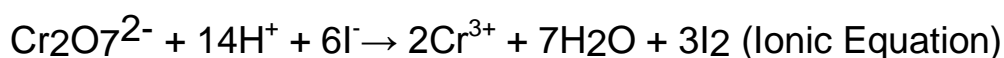
- (iv) **Action of concentrated sulphuric acid :** In cold, red crystals of chromic anhydride (CrO₃) are formed



- (v) **Oxidising properties :** Potassium dichromate is a powerful oxidizing agent. In acidic solution, its oxidizing action can be represented as follows.

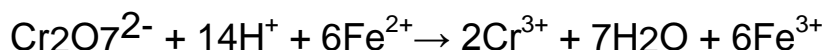


- (a) It oxidises iodides to iodine



This reaction is used in the estimation of iodide ions in the volumetric analysis.

- (b) It oxidises ferrous salts of ferric salts:

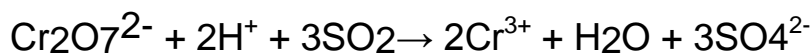


This reaction is used in the estimation of ferrous ions in the volumetric analysis.

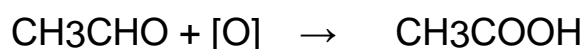
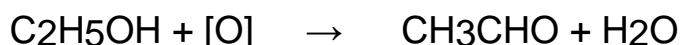
(c) It oxidises H_2S to S :



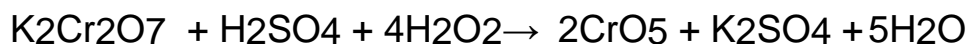
(d) It oxidises sulphur dioxide to sulphuric acid :



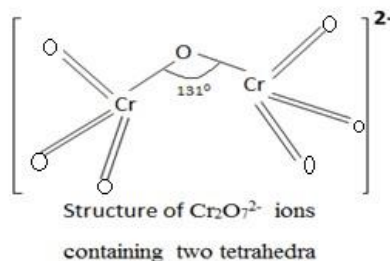
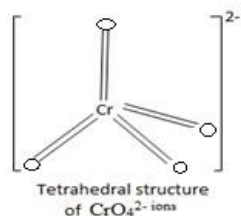
(e) It oxidises ethyl alcohol to acetaldehyde and acetic acid :



(vi) **With hydrogen peroxide** : Acidified potassium dichromate forms a deep blue colour with hydrogen peroxide due to the formation of CrO_5 .



The blue colour fades away gradually due to decomposition of CrO_5 into Cr^{3+} ions and oxygen.



(vii) **Structure of chromate and dichromate ions** :

Uses.

- (i) In volumetric estimation of reducing agents e.g., ferrous salts, iodides and sulphites. This is due to the fact that $\text{K}_2\text{Cr}_2\text{O}_7$ is obtained in a much higher degree of purity than $\text{Na}_2\text{Cr}_2\text{O}_7$
- (ii) In the preparation of chromium compounds e.g., chrome alum.
- (iii) In photography for hardening of gelatin.
- (iv) In dyeing for producing $\text{Cr}(\text{OH})_3$ as mordant.
- (v) Chromic acid mixture ($\text{K}_2\text{Cr}_2\text{O}_7 + \text{conc. H}_2\text{SO}_4$) is used for cleaning glass wares in the laboratory.
- (vi) As an oxidizing agent.
