

Permanganometry

Redox titrations with standard potassium permanganate solution as an oxidant is called permanganometry.

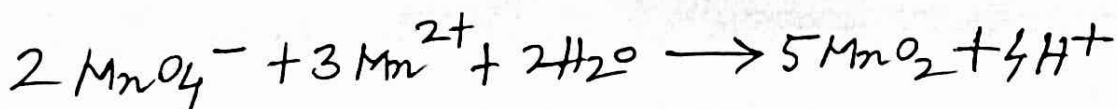
KMnO₄ is not a primary standard. Why?

- 1) Its crystals are impure — contains MnO₂.
- 2) Its aqueous solution is unstable, because traces of organic matter present in the distilled water catalyses the auto-decomposition of KMnO₄ solution on standing.



- 3) Bright sunlight also catalyses the decomposition of KMnO₄ solution. Hence aqueous solution of KMnO₄ is to be preserved in dark coloured glass stoppered bottle.

- 4) Manganous ion helps the decomposition of KMnO₄ solution rapidly in neutral solution.

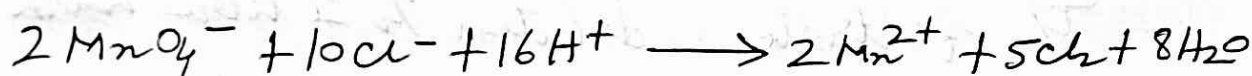


Hence, it is required for KMnO₄ solution to be standardised with a primary standard solution of oxalic acid, sodium oxalate etc.

Titrations involving $KMnO_4$ (in acid medium)

Titrations are usually carried out in acid medium. Among the three mineral acids, only H_2SO_4 is most suitable because it does not act on MnO_4^- ion in dilute solution.

HCl is unsuitable due to its reducing action.

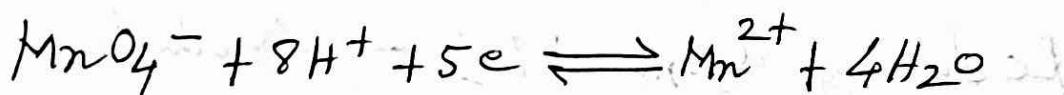


This consumes permanganate in excess.

Nitric acid cannot be used because it is an oxidising agent itself.

Preparation of (N/10) $KMnO_4$ solution

In acid medium,



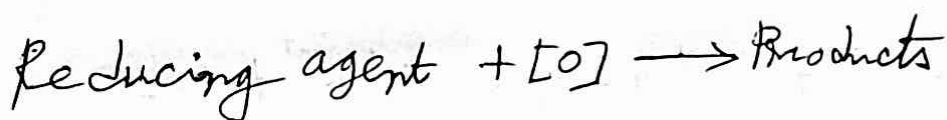
$$\begin{aligned} \text{Equivalent weight of } KMnO_4 &= \frac{\text{Molecular weight}}{\text{No. of electrons gained per molecule}} \\ &= \frac{158.034}{5} \\ &= 31.606 \end{aligned}$$

(N/10) $KMnO_4$ solution is prepared by dissolving 3.2 gm solid $KMnO_4$ in 500ml distilled water in a 1 litre beaker, gently boiled for about 15 minutes and allowed to cool at room temperature. It is then filtered through a plug of glass wool fitted in a funnel to remove it from MnO_2 .

The filtrate is diluted to 1 litre with distilled water and the solution is stored in a amber colour bottle.

Indicator

In the presence of dilute H_2SO_4 , potassium permanganate reacts with reducing agents.



As the titration proceeds potassium sulphate and manganese sulphate accumulate.

As soon as the oxidation is complete and $KMnO_4$ is in excess, the solution becomes

pink. Thus KMnO_4 acts as a self indicator.

During titration, at the end point the pink colour fades very slowly to colourless due to the interaction between permanganate ion with Mn^{2+} ion formed during the reaction.

