C 142 (Expt. No. 11)

NAME : _____ BATCH : _____

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ESTIMATION OF IODINE CONTENT IN IODIZED COMMON SALT USING IODOMETRY

AIM

To estimate the **iodine content** in **iodized common salt**, using **iodometry.**

THEORY

In **iodometry**, an oxidizing agent **(KI)** is **added to excess iodide (I^-) to produce iodine (I_2),** which is then **titrated with sodium thiosulfate ($Na_2S_2O_3$)**, using **starch as indicator.** Molecular iodine is only slightly soluble in water, but its solubility is greatly enhanced by **complexation with iodide**. Therefore, using a **slight excess of iodide** helps to keep the **liberated iodine in solution** as brown **I_3^-.**

A given amount of iodized salt is treated with concentrated sulfuric acid, which liberates iodine. The free iodine is titrated against sodium thiosulfate, using starch as indicator.

MATERIALS REQUIRED

Iodized salt, KI solution (10 %), 2N H_2SO_4, sodium thiosulfate solution (0.005 M), potassium dichromate, sodium bicarbonate, 5N HCl, starch solution, conical flasks, beakers, burette, pipettes, measuring cylinders.

PROCEDURE

PART - A : Standardization of $Na_2S_2O_3$ solution

1. Pipette out 10 ml of **0.01 N potassium dichromate** ($K_2Cr_2O_7$) solution into a 250 ml conical flask.

2. Add 30 ml distilled water.

3. Add **0.8 g** of sodium bicarbonate, **2 ml** of **10 % KI** solution, followed by **2 ml** of **5N HCl** solution.

4. Cover the conical flask and keep it **in the dark** for **about 5 minutes.**

This is don e to avoid any side reaction from o ccurring which can generate more iodine (from iodide), by exposure to light.

5. Titrate the **liberated I_2** against **0.01N sodium thiosulfate** solution (taken from the burette), till you get a **straw yellow color.**

6. Add **approximately 1 ml** of **starch indicator** solution.
The solution will turn **blue**.

7. Continue the titration until the solution becomes **colorless**.

8. Note the titre value (volume of **$Na_2S_2O_3$** solution added).

9. **Calculate the actual strength of $Na_2S_2O_3$ solution used.**

PART - B : Strength of Iodine solution

1. Weigh out **5 g** of the **salt sample**, and transfer into a 250 ml conical flask. Dissolve the salt in **50 ml distilled water**.
2. Add 1 ml of **2N H_2SO_4** solution using a measuring cylinder.
4. Add 2 ml of **10 % KI** solution.
5. **Stopper the flask**, and keep it **in the dark** for **about 5 minutes.**

This is don e to avoid any side reaction from o ccurring which can generate more iodine (from iodide), by exposure to light.

6. Rinse and fill the burette with **$Na_2S_2O_3$** solution **(already standardized in PART – A).**

Note the initial reading.

7. Remove the conical flask from the cupboard, and titrate against **$Na_2S_2O_3$** solution (from the burette) until the solution turns **straw yellow**.
8. Add approximately **1 ml** of **starch indicator** solution.

The solution will turn **blue**.

9. Continue the titration until the solution becomes **colorless**.
10. Note the **titre value** (volume of **$Na_2S_2O_3$** solution added).
11. **Calculate the iodine present in parts per million (ppm).**

OBSERVATIONS

Room Temperature = …….. ^oC

Table 1. Standardization of $Na_2S_2O_3$ solution

Volume of $K_2Cr_2O_7$ used = 10 ml

Sl. No.	Initial Reading (ml)	Final Reading (ml)	Titre Value (ml)
1.			
2.			
3.			

Strength of $Na_2S_2O_3$ = $\frac{V(K_2Cr_2O_7) \times S(K_2Cr_2O_7)}{V(Na_2S_2O_3)}$

=

Table 2. Determination of strength of Iodine
Volume of Iodine solution used = 50 ml

Sl. No.	Initial Reading (ml)	Final Reading (ml)	Titre Value (ml)
1.			
2.			
3.			

Strength of I_2 = $\dfrac{\mathbf{V\ (Na_2S_2O_3)\ x\ S\ (Na_2S_2O_3)}}{\mathbf{V\ (I_2)}}$

=

CALCULATIONS

Calculation of Iodine in iodate containing salt sample :

$$\mathbf{IO_3^- + 5\ I^- + 6\ H^+ \longrightarrow 3\ I_2 + 3\ H_2O}$$

$$\mathbf{3\ I_2 + 6\ S_2O_3^{2-} \longrightarrow 3\ S_4O_6^{2-} + 6\ I^-}$$

$$\mathbf{IO_3^- + 6\ S_2O_3^{2-} + 6\ H^+ \longrightarrow 3\ S_4O_6^{2-} + I^- + 3\ H_2O}$$

Redox change for Iodine when transforming from iodate to iodide involves 6 electrons.

Let the actual strength of $Na_2S_2O_3$ = ***X* (thio)**
Since 5 g of salt is made up to **50 ml,** this volume can be used in the calculation. The strength of I_2 can be calculated.
Let the actual strength of I_2 solution = ***Y* (I_2)**

In 5 g of salt, **1 N = 126.90 g of iodine**
For ***Y* (I_2) = 126.90 x *Y* (I_2) [in grams)].**
For 1000g = [*Y* (I_2) x 1000] / 5 grams = *C* grams of I_2.

= *C* x 10^3 ppm

RESULTS

1. Strength of $Na_2S_2O_3$ = ……. N

2. Strength of I_2 = ……. N

3. The amount of Iodine in the sample of supplied iodized salt = ……. ppm.