

# Experiment 1: Determination of Iodine in Iodized Salt

## Purpose

To accurately determine the iodine concentration of iodized salt.

## Equipment Needed

2 250 mL Erlenmeyer flasks, Bunsen burner, boiling stones, buret

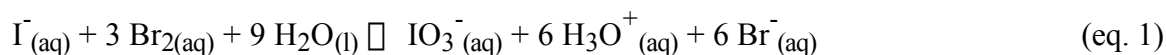
## Chemicals Needed

iodized salt, methyl orange indicator, 1 M H<sub>2</sub>SO<sub>4</sub>, bromine water, 0.001 M Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> solution, starch solution, KI<sub>(s)</sub>

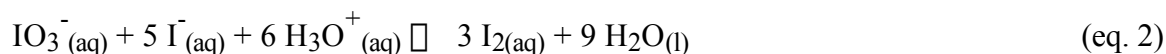
## Discussion

Iodine (in the form of KI) is often added to table salt for dietary reasons. In this experiment we will perform a redox titration to determine the I<sup>-</sup> in table salt.

In acidic solutions, the I<sup>-</sup> ion can be oxidized to the iodate ion, IO<sub>3</sub><sup>-</sup> by Cl<sub>2</sub> or Br<sub>2</sub>.



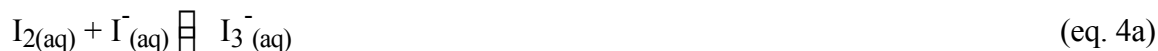
The iodate ion formed in eq. 1 will react with added iodide ion to form iodine in acidic solution:



The iodine is then titrated with sodium thiosulfate:



The progress of this titration is monitored using starch indicator. As long as some I<sub>2</sub> and I<sup>-</sup> are both present, there will be some I<sub>3</sub><sup>-</sup> in solution, which reacts with starch to form a dark blue complex:



When all the I<sub>2</sub> has been consumed by eq. 3, the blue color of the starch complex will fade and the solution will turn clear. This marks the endpoint of the titration.



## Procedure

### A. Preparation of iodate solutions

Accurately weigh two 250 mL flasks. Add approximately 10 g iodized table salt to each flask and re weigh. Record on the data sheet. Add about 50 mL water and 2 drops of methyl orange indicator to each flask, and then carefully add 1 M  $\text{H}_2\text{SO}_4$  until the solutions change from yellow to pink, plus 2.0 mL excess.

Add small portions of bromine water, with swirling, until the solution takes on a faint persistent yellow tint indicating an excess of bromine has been added. Add 2-3 boiling stones and gently boil the solution until it turns colorless to drive off the excess bromine. Allow to cool to room temperature before proceeding to part B.

### B. Titration with sodium thiosulfate

To each flask, add 0.2 g KI and 2-3 mL starch solution. Titrate each flask with 0.001 M  $\text{Na}_2\text{S}_2\text{O}_3$  until the solution changes from blue to colorless, recording the volume of  $\text{Na}_2\text{S}_2\text{O}_3$  on the data sheet.

## Calculations

The number of moles of sodium thiosulfate is given by

$$n(\text{Na}_2\text{S}_2\text{O}_3) = M(V(\text{Na}_2\text{S}_2\text{O}_3))$$

From equations 1 - 3, it can be seen that

$$n(\text{I}^-) = n(\text{Na}_2\text{S}_2\text{O}_3) \times \frac{1 \text{ mol I}_2}{2 \text{ mol Na}_2\text{S}_2\text{O}_3} \times \frac{1 \text{ mol IO}_3^-}{3 \text{ mol I}_2} \times \frac{1 \text{ mol I}^-}{1 \text{ mol IO}_3^-} = n(\text{Na}_2\text{S}_2\text{O}_3) \times \frac{1}{6}$$

The mass of KI and the mass percent of KI in the salt sample can be calculated.

Lab Report  
Experiment 1  
Determination of Iodine in Iodized Salt

Name \_\_\_\_\_

Date \_\_\_\_\_

**A. Data**

1. Mass of empty flask \_\_\_\_\_
2. Mass of flask and salt \_\_\_\_\_
3. Mass of salt \_\_\_\_\_
4. Initial buret reading of  $\text{Na}_2\text{S}_2\text{O}_3$  \_\_\_\_\_
5. Final buret reading of  $\text{Na}_2\text{S}_2\text{O}_3$  \_\_\_\_\_
6. Volume of  $\text{Na}_2\text{S}_2\text{O}_3$  \_\_\_\_\_

**B. Calculations**

1. Moles of  $\text{Na}_2\text{S}_2\text{O}_3$  used \_\_\_\_\_
2. Moles of  $\text{I}^-$  in salt sample \_\_\_\_\_
3. Mass of KI in salt sample \_\_\_\_\_
4. Percent by mass of KI in iodized salt \_\_\_\_\_

