

Iodized Salt

Food Additive Demonstration



Introduction

Are food additives healthy or unhealthy? This is a controversial topic in society today. Many people associate food additives with highly processed convenience foods that are unhealthy. But not all food additives are unhealthy. Iodine, in the form of potassium iodide, was the first additive approved by the federal government for use in foods. Potassium iodide is added to salt to prevent thyroid diseases caused by a lack of iodine in the diet. The presence of iodide in iodized salt can be demonstrated by reaction with chlorine water, a strong oxidizing agent.

Concepts

- Food additives
- Iodine
- Thyroid hormone

Materials

Chlorine water, Cl_2 in H_2O , 1 mL

Iodized table salt, 5 g

Potassium iodide, KI, 0.2 g

Sodium chloride (reagent), NaCl, 5 g

Starch solution, 0.5%

Water, distilled or deionized

Balance, centigram

Beral-type pipets, 2

Graduated cylinder, 10-mL

Test tubes, 16 × 150 mm, 3



Safety Precautions

Chlorine water is toxic by ingestion and inhalation. Do not breathe chlorine vapors. Conduct this demonstration in a well-ventilated lab and dispense the chlorine water in a hood if possible. All food-grade items that have been brought into the lab are considered laboratory chemicals and are for lab use only. Do not taste or ingest any food items in the chemical laboratory and do not remove any remaining food items after they have been used in the lab. Wear chemical splash goggles and chemical-resistant gloves and apron. Please review current Material Safety Data Sheets for additional safety, handling, and disposal information.

Procedure

1. Label three large test tubes A, B, and C and add the following reagents to each test tube: 0.2 g of KI to test tube A, 5 g of NaCl to test tube B, and 5 g of iodized salt to test tube C.
2. Add 5 mL of distilled or deionized water to each test tube. *Note:* The solids in test tubes B and C will not fully dissolve. The excess solid is used because KI is present in very small amounts in iodized salt.
3. Add 5 drops of starch solution, followed by 2–3 drops of chlorine water, to each test tube.
4. Compare the color changes observed in each test tube and discuss the qualitative evidence for the presence of iodide in iodized table salt. *(Potassium iodide solution in test tube A produces a dark blue-black solution. Sodium chloride in test tube B is present in two phases, a clear and colorless solution and a dense white solid on the bottom of the tube. Iodized table salt in test tube C is also present in two phases, a blue solution and a dense white solid on the bottom of the tube.)*

Disposal

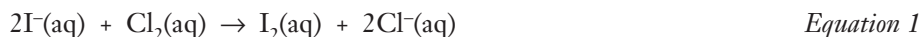
Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures, and review all federal, state and local regulations that may apply, before proceeding. The remaining solutions may be rinsed down the drain with excess water according to Flinn Suggested Disposal Method #26b. Allow the excess chlorine water solution to stand in an open container under a hood in a well-ventilated, protected area. The water remaining after the chlorine gas has evaporated may be rinsed down the drain.

Tips

- Saturated chlorine water is available from Flinn Scientific. Less concentrated solutions are easy to prepare and will also work. To prepare 30 mL of chlorine water: Mix 5 mL of 5% sodium hypochlorite (bleach) solution with 10 mL of 1 M hydrochloric acid in a hood. Dilute to 30 mL with water. Prepare this solution fresh the day of the demonstration.
- Potassium iodide is added to salt in amounts ranging up to 0.01%. Calculate the mass of potassium iodide in one table spoon of iodized table salt and compare with the RDA for iodine in young adults (150 µg).
- Read the ingredients label on a container of iodized salt—there are a surprising number of additives. In addition to potassium iodide, other ingredients in iodized salt include dextrose (a reducing agent to prevent oxidation of iodide), sodium bicarbonate (a base to stabilize the iodide), and calcium silicate (an anti-caking agent to keep the salt free-flowing).

Discussion

Iodine is an essential nutrient. It is required by the body for the synthesis of the thyroid hormone thyroxine. The primary symptom of iodine deficiency is goiter, an enlargement of the thyroid gland. The widespread use of iodized table salt has largely eliminated this health problem in our society. The presence of potassium iodide in iodized salt was identified by oxidation of iodide ion to iodine (Equation 1). Iodine was detected by means of its familiar blue-black complex with starch (Equation 2).



Connecting to the National Standards

This laboratory activity relates to the following National Science Education Standards (1996):

Unifying Concepts and Processes: Grades K–12

- Evidence, models, and explanation
- Constancy, change, and measurement

Content Standards: Grades 9–12

- Content Standard A: Science as Inquiry
- Content Standard B: Physical Science, chemical reactions
- Content Standard F: Science in Personal and Social Perspectives, personal and community health, natural and human-induced hazards, science and technology in local, national, and global challenges

Reference

This activity was adapted from *Flinn ChemTopic™ Labs*, Volume 23, *Chemistry of Food*; Cesa, I., Editor; Flinn Scientific: Batavia, IL (2003).

Materials for *Iodized Salt—Food Additive Demonstration* are available from Flinn Scientific, Inc.

Catalog No.	Description
C0055	Chlorine Water
P0066	Potassium Iodide, 25 g
S0061	Sodium Chloride, 500 g
S0151	Starch Solution, 0.5%, 500 mL

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.