

Test for Sodium Radical



General Aim

Detection of the presence of sodium ions as base radical in inorganic salts such as sodium chloride.

Method

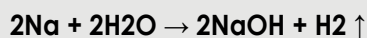
Detection of the presence of sodium as a base radical using specific chemical reagents.

Learning Objectives (ILOs)

- Define and differentiate between members of the sixth group cations and those of other cation groups.
- Classify inorganic salts according to their base radicals.
- Compare between sodium containing salts and other members of the same group in terms of chemical structures, properties and reactions.
- Identify sodium radicals containing salts experimentally.
- Select the appropriate reagents to detect the presence of sodium radical.
- Balance the chemical equations of chemical reactions.

Theoretical Background/Context

- Sodium is a metallic element and a member of the alkali metals group that are located in the first group of the periodic table. Its chemical symbol is Na. Sodium has a silver metallic soft appearance. Sodium is considered to be the sixth abundant element in the Earth's crust. Pure sodium is highly reactive and it can react with minimal amounts of water leading to vigorous liberation of hydrogen gas that could result in an explosion.



That is why, sodium is not commonly found in a pure form and if found, it should be kept in oil. Sodium is used in different heat transfer applications, chemical synthesis techniques, etc.

Abundance of Sodium in Nature

Sodium is abundant in nature as sodium ions in mineral salts such as sodium chloride. It is commonly found as a constituent in Earth's oceans, bodies of water, soil, and many biological fluids in our bodies.

Properties and Uses of Sodium

Sodium as a metal has a boiling point of 97°C . Therefore, molten sodium is used as a cooling agent in nuclear reactors. In addition, it has been used in the research of development of sodium/sulfur batteries. It is also used as the basic radical in preparation of various chemical compounds such as sodium chloride, sodium hydroxide (lye), sodium carbonate (washing soda) and sodium sulfate.

Sodium Salts

Sodium chloride is one of the most commonly abundant sodium salts. Sodium Chloride is commonly known as table salt as it is the main salt used in food. In addition, it is also known as sea salt although sea water contains other salts. This is attributed to that sodium chloride is the main salt that is responsible for the salinity of the sea water and other extracellular body fluids. For instance, unrefined sea salt consists of sodium chloride in addition to trace amounts of magnesium and calcium halides and sulfates, algal products, salt-resistant bacteria and sediment particles.

Sodium chloride is an ionic compound whose chemical formula is NaCl containing both sodium and chloride ions in an equal ratio of 1:1.

Preparation of Sodium Chloride

Sodium chloride is extracted from sea water by evaporation before undergoing some refinement to extract it in a pure form. It has been early processed around 6,000 BC, in Romania, where people started to boil water to extract sea salts. It was also extracted and utilized since then by the Chinese, ancient Hebrews, the Greeks, the Romans, the Byzantines, the Hittites, the ancient Egyptians,

Properties and Uses of Sodium Chloride

- Sodium chloride is a white crystalline salt that is highly soluble in water producing colorless aqueous solutions.
- Sodium chloride has the chemical formula of NaCl with molecular weight of 58.44 g/mol.
- Sodium chloride salt possesses a melting point and boiling point of 801 °C and 1465 °C, respectively.
- Sodium chloride plays an important role in manipulating water amounts and isotonicity of body fluids.
- Sodium chloride regulates the muscle contractions and nerve impulses.
- Sodium chloride is used in some medications.

Principle of Work

- In this experiment, sodium ion in sodium chloride is detected through some identification and confirmatory tests. The sodium radical is among the sixth group of basic radicals that are also called the soluble groups. This returns back to that all of the members remain soluble throughout most of their identifications tests.
- During the experiment, salt solubility in water will be tested. Then confirmatory tests will be carried out which are sodium cobalt nitrite test, potassium antimonate and flame test.

First: Physical Appearance Test

In this test, the physical appearance of sodium salt is investigated in terms of color, odor, texture, etc.

Second: Solubility Test

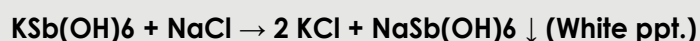
In this test, a sample of the sodium chloride salt is tested for its solubility in cold and hot water.

Third: Sodium Cobalt Nitrite Test

It depends on the fact that sodium cobalt nitrite will not react with sodium chloride as the nitrite would not be able to displace chloride in its salts.

Fourth: Potassium Antimonate Test

It depends on the fact that antimonate could displace chloride ions in its salts leading to precipitation of sodium antimonate as a white precipitate after hard scratching of the test tube wall. The reaction of the test is:



Fifth: Flame Test

It is also called a dry test as it uses the sodium chloride salt as it is without dissolving it in water. It depends on the fact that sodium chloride can change the non-luminous benzene flame into an ignited yellow colored flame.