

Test for Amide Group



General Aim

To test for amide-containing organic compounds through the chemical detection of amide groups.

Method

Detection of the presence of amides using special and specific reagents.

Learning Objectives (ILOs)

- Define and determine organic compounds containing amide groups theoretically through their chemical structure.
- Classify organic compounds containing amide groups into aliphatic and aromatic.
- Compare between amide groups and other functional groups in terms of chemical structures, properties and reactions.
- Identify amides experimentally.
- Select the appropriate reagents to differentiate between amides and other organic compounds.

Theoretical Background/Context

- Amides are organic compounds that are considered as acid amides. Although the main dominant class of amides is the carboxamide, phosphamides and sulphamides are also abundant.
- Carboxyamides possess at least one amide group (-CONH-). The functional group a carbonyl group (C=O) and amino group (-NH₂) linked together. Amides (R - CON - R₂') are characterized by the possibility of having its R groups as a terminal H in their structure. In other words, the N can be linked with one or two H atoms instead of R groups.
- The role that amides play in our real life is controlled by their properties. Amides are used in various applications in different fields such as food industry, pharmaceuticals, etc.

First: Preparation of Amides

The simplest form of amide is prepared from ammonia, where a hydrogen atom is replaced by an acyl group. The product is described as a primary amide where its general formula is represented as R - CO - NH₂. In the same way, secondary and tertiary amides can be prepared from primary and secondary amines, respectively.

Second: General Properties of Amides

Amides are considered very weak bases compared to their corresponding amines. This is noticed from their pK_a which is around -0.5, while that of the corresponding amines exceeds 9.5. Amides are less soluble than their corresponding carboxylic acid and amines. This is attributed to the ability of the later compounds to both accept and donate hydrogen bonds. Solubility of amides can be comparable to their corresponding esters.

Principle of Work

In this experiment, amides are tested through detecting their carboxamide groups using chemical tests. In addition, these tests can be used to differentiate between amides and other organic classes especially those containing carbonyl groups. This is done through using specific reagents.

Sodium hydroxide and Hydrochloric acid Test

In this test, sodium hydroxide is added to a sample containing amide compound, where the sodium oxide replaces the amino group leading to evolution of ammonia gas. Ammonia gas then can be detected using hydrochloric acid as they react together forming white fumes of ammonium chloride as shown in the following chemical reactions.

