

Identification of Unknown Organic Compounds: Experiment Report

4 pages | 907 words

Abstract

The main objective of this lab was to identify two unknown organic compounds, one solid and one liquid, using various methods including melting point (M.P), boiling point (B.P), Infrared spectroscopy (I.R), elemental analysis, and the determination of the Index of Hydrogen deficiency (IHD). The physical properties of the compounds, such as color, odor, melting point, and boiling point, were also examined to gain insight into their characteristics.

Introduction

Identification of unknown organic compounds is a fundamental task in chemistry. It is crucial to determine the composition, structure, and functional groups present in these compounds. In this lab, we employed several techniques to achieve this goal, including melting point and boiling point determination, Infrared spectroscopy, elemental analysis, and calculation of the Index of Hydrogen deficiency (IHD). The functional group of a compound can be determined using Infrared spectroscopy, which provides a spectra based on the chemical bonds present in the compound. The Index of Hydrogen deficiency (IHD) helps determine the degree of saturation in a compound, indicating the presence of double bonds, triple bonds, or rings. Elemental analysis is a powerful method for determining the molecular formula of a compound by analyzing its elemental composition. Additionally, the boiling point and melting point of a compound are crucial physical properties that can confirm its hypothetical structure.

Materials and Methods

The following equipment and materials were used in the experiment:

Equipment and Materials	Quantity
Electric melting point apparatus	1
Mini scale setup (heating mantle, test tube, thermometer)	1
NICOLET iS5 FT infrared spectrometer	1
Capillary tubes	Multiple
Acetone	As needed

Experimental Procedure

Two unknown organic compounds, one solid and one liquid, were provided for analysis. The following procedures were performed:

- For the solid compound:
 - A sample of the crystalline solid was taken in a bulb of a capillary tube.
 - The capillary tube was inserted into the electric melting point apparatus.
 - The temperature was increased at a rate of 1-2°C/min.
 - The initial temperature was noted when the first tiny drop of liquid appeared.
 - The final temperature was noted when all the crystals had completely melted.
- For the liquid compound:
 - 0.5-1.0 ml of the liquid was taken in a clean test tube.
 - The test tube was clamped and held on top of a heating mantle.
 - A thermometer was placed 2 cm above the liquid with another clamp.
 - The initial temperature was recorded when the first bubble appeared, and the final temperature was recorded when there was vigorous movement in the liquid.
- Both the solid and liquid samples were scanned using a NICOLET iS5 FTIR spectrometer. The surface was cleaned thoroughly with acetone, and the background spectrum was collected before the sample spectra.

Results

The results of the analysis are summarized in the following table:

Compound	Empirical Formula	IHD	Experimental Melting Point (°C)	Reference Melting Point (°C)	Experimental Boiling Point (°C)	Reference Boiling Point (°C)
Solid	C ₇ H ₆ O ₂	5 (4 double bonds, 1 ring)	116.7	122.41	N/A	N/A
Liquid	C ₅ H ₁₀ O	1 (1 ring...)				

Identification Of Unknown Organic Compounds

Mike Jess



Identification Of Unknown Organic Compounds:

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