



Lab of Organic Chemistry

1nd stage

Asst. Lect. estabraq Aref Mohammed

Lecture 2

"Melting Point Determination Experiment"

Department of Life Sciences

Melting Point Determination Experiment

Introduction

The melting point determination is one of the fundamental experiments in organic chemistry laboratories. It is used to determine the temperature at which a substance changes from the solid state to the liquid state. The melting point is considered an important physical property that helps in identifying organic compounds and determining their purity.

Pure substances usually have a sharp and fixed melting point, while impure substances melt over a wider temperature range and at a temperature lower than that of the pure compound due to the presence of impurities. Therefore, this experiment is widely used to confirm the identity of an organic compound obtained from a reaction or to evaluate its purity.

*Aim of the Experiment

The melting point determination experiment aims to:

Determine the melting point of a solid organic compound.

Identify the purity of the organic compound.

Understand the effect of impurities on the physical properties of compounds.

Theoretical Principle

When a solid substance is heated, its molecules gradually gain kinetic energy. At a certain temperature, the attractive forces between the molecules weaken, causing the substance to change from the solid state to the liquid state. This temperature is called the melting point.

In pure substances, melting occurs within a very narrow temperature range (usually 1–2°C). However, in impure substances, the melting occurs over a wider range because impurities disturb the arrangement of molecules in the crystal structure.

Factors Affecting the Melting Point

Purity of the Substance: .

Pure substances have a fixed melting point, while impurities lower the melting point and broaden the melting range.

Molecular Structure:

Stronger intermolecular forces lead to higher melting points.

Molecular Weight:

Generally, an increase in molecular weight leads to a higher melting point.

Crystal Structure:

A well-ordered crystal structure increases the melting point.

Heating Rate:

Rapid heating may lead to inaccurate melting point measurements.

Procedure

A small amount of the solid sample is finely ground to obtain a fine powder.

One end of the capillary tube is sealed by gentle heating.

A small amount of the powdered sample is introduced into the capillary tube so that the height of the sample is about 2–3 mm.

The capillary tube is attached to the thermometer using a rubber band or a small clamp.

The thermometer and capillary tube are placed in an oil bath or melting point apparatus.

The oil bath is heated slowly and gradually to obtain an accurate reading.

The sample is observed and two temperatures are recorded:

The temperature at which melting begins.

The temperature at which the sample completely melts.

Discussion Questions

Q1 :What is meant by melting point?

Q2 :Why is the melting point considered an important physical property in organic chemistry?

Q3 :Why do pure substances have a definite melting point?

Q4: What is the effect of impurities on the melting point?

Multiple Choice Questions (MCQ)

1-What is the melting point?

- A) The temperature at which a substance changes from liquid to gas
- B) The temperature at which a substance changes from solid to liquid
- C) The temperature at which a substance changes from gas to liquid
- D) The temperature at which a liquid evaporates

2-Pure substances are characterized by having:

- A) Low melting point
- B) Wide melting range
- C) Sharp and fixed melting point
- D) No melting point

3-The presence of impurities in a substance causes:

- A) Increase in melting point
- B) No change in melting point
- C) Decrease in melting point and wider melting range
- D) Constant melting point

4-Which tool is used to hold the sample in the melting point experiment?

- A) Volumetric flask

B) Capillary tube

C) Burette

D) Pipette

5- Why should the sample be heated slowly during the experiment?

A) To reduce experiment time

B) To obtain an accurate melting point reading

C) To change the color of the compound

D) To evaporate the substance