Melting point .. : temperature at which transition from Solid to liquid.

درجة الحرارة اللي بتحول فيها الصلب إلى سائل.

used for

- identily — عشان أعرف هوية المركب ..
- purity — وعشان أعرف درجة النقاء بإله ..

Melting point يختلف عن boiling point من حيث التأثر بالحالة الجوية

Why? — ليه بتفضل صلبة وما بتأثر بدرجة الحرارة العرفة ..

بتفضل صلبة بسبب intermolecular forces ..

which holding the individual Molecules together in Crystal lattice.

↓

اختلاف هدول الروابط هو السبب الرئيسي لاختلاف درجات الانصهار

روابط أقوى ← درجة انصهار أعلى.
روابط أضعف ← درجة انصهار أقل.

Melting point Unaffected by changes in External pressure.. ← ما بتأثر

↓

هاد الشي اللي بخليه .. Convenient physical ثابت فيزيائيًا ..

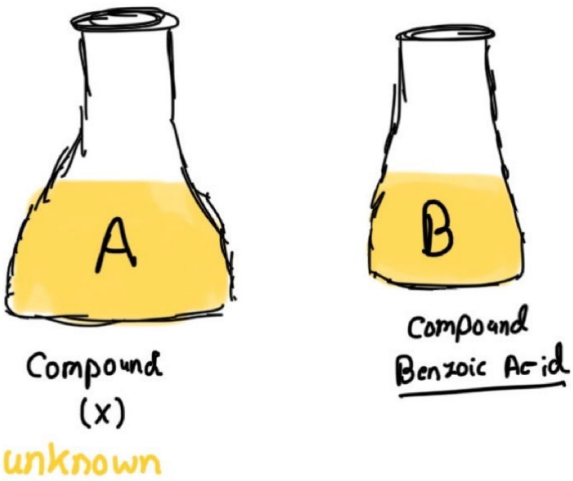
اللي بسهل وبساعد على تحديد هوية المواد الصلبة.

الشوائب شو بتأثر على الـ Melting point .. ؟

- unSoluble — Such glass — No effect
- Soluble — Solvent-
  1. بتقلل هذا البخار ← بتقلل درجة الانصهار
  2. بتوسع نطاق الانصهار ← اعتمادًا على كمية الشوائب

كل ما زادت الشوائب ← بقل درجة الانصهار

كيف نقطة الانصهار بساعدنا نعرف إذا المركبين مُتشابهين ولا لأ ؟؟



* والـ (٢) الـ (Melting point) = 120°

Q كيف بدّي اعرف إذا الـ compound عبارة عن (Benzoic Acid) A

ولا عبارة عن مركب آخر محلول بشوائب
خلت الـ Melting point إلها مُشابهة لـ Benzoic Acid ؟

الجواب : رح نخلط المركبين مع بعض ورح يكون عنّا حالتين :

١ إذا الـ (Compound A) عبارة عن Benzoic Acid ..
رح يضل الـ Melting point ثابت بعين (120°) عادي -

إذا كان الـ (Compound A) هو Benzoic Acid !!
* شو رح يصير ؟
رح يتحاول المركب B (Benzoic Acid) مع المركب الآخر
كأنه شوائب رح تقل درجة الانصهار عن الـ 120°
وتزيد عن ثبات الانصهار حسب موقعها عن الشوائب.

MELTING POINTS

Identity and Purity of Solid Organic Compounds

INTRODUCTION

The melting point of a solid is the temperature at which transition from solid to liquid occurs at atmospheric pressure; or the temperature at which solid and liquid phases are in equilibrium at a pressure of one atmosphere. The melting point is practically unaffected by changes in external pressure, making it a convenient physical constant for the identification of solids.

Many organic compounds are solids at room temperature as a result of strong intermolecular forces which hold the individual molecules together in a crystal lattice. The nature and strength of these intermolecular forces are responsible for the observed differences in melting point. In general, if the forces are strong, the melting point will be high, and if they are relatively weak, the melting point will be low.

A pure solid has a sharp melting point and will melt within a narrow range of 1-2 °C. Soluble impurities affect the melting point of a solid in the following manner:

a. Lower the melting point of the substance, with the upper limit considerably below the true melting point. The presence of an impurity in the molten compound, reduces its vapor pressure thus lowering the melting point of the compound (Figure 5a). The greater the amount of impurity, the greater is the melting point depression (Figure 5b).

b. Broaden the melting point range. Depending on the amount of impurity, the melting process may extend over a range of 2-20 °C or more. Insoluble impurities (*e.g.*, glass, sand ...*etc.*) do not affect the melting point or the melting point range.

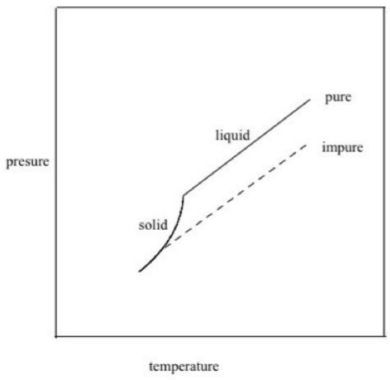


Figure 5a.
Vapor pressure-temperature diagram.

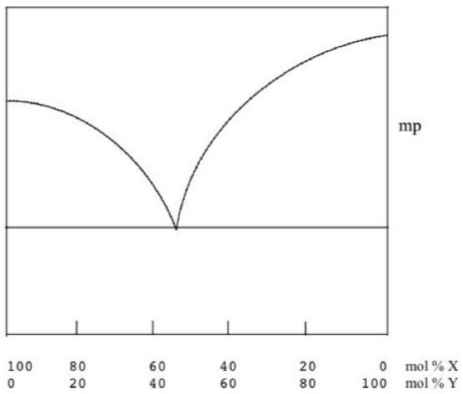


Figure 5b.
Temperature-composition diagram.

يقدر استخدم نقطة الانصهار لأحد إذا كان المركبين متشابهين أو لا - قلنا أنهدنا بالصفحة اللي قبل..

Mixture melting points can be used in the following manner to determine whether two compounds are the same or different even though they have similar melting points. Assuming that a given organic compound (A) melts sharply at 120 °C, and benzoic acid (compound B) also has a melting point of 120 °C. Is compound (A) benzoic acid or a different compound?

If compound (A) is benzoic acid, then a mixture melting point of (A) and (B) will melt sharply at 120 °C, *i.e.* the same as each individual compound alone. If, on the other hand, compound (A) is not benzoic acid, then the mixture melting point of (A) and (B) will be lowered and the melting range will be broadened. Since they are different compounds, each behaves as an impurity in the other.

GENERAL PROCEDURE

Apparatus. A simple device for determining melting points is shown in Figure 6. It consists of a thermometer fitted through a cork and suspended into a long-necked flask which is three quarters filled with a high ① boiling and stable ② liquid like (paraffin oil), (di-butylphthalate) or (silicon oil). The thermometer bulb should be about 1 cm above the bottom of the flask. The sample in the

مقسمتك إلى ثلاث أرباعه..

capillary tube is fastened to the thermometer with a rubber band placed above the level of the oil. The capillary tube should be close to and on a level with the thermometer bulb.

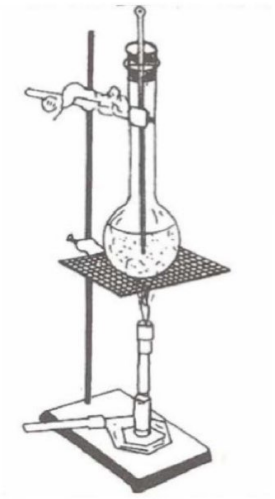


Figure 6.
Melting point apparatus.

Capillary melting point tubes are about 6-7 cm in length and 1 mm in diameter. They are sealed by rotating one end of the capillary tube in the edge of a small hot flame. The dry solid is ground to a fine powder on a piece of paper with a spatula. The open end of the capillary is then pushed into the powder which is forced down the capillary tube by gently tapping the closed end on the bench top. This is repeated several times until the solid is densely packed at the bottom of the tube to a height of 2-3 mm.

Procedure. To determine the melting point of a solid, a small amount of the powdered substance is introduced into a capillary tube which is then attached to a thermometer and placed in the oil bath. The bath is heated rapidly to within 20 °C of the expected melting point then slowly, and at a constant rate of 2-3 degrees per minute, close to the melting point. The temperature at which the solid begins to melt, and that at which it is completely liquid, is recorded as the melting point range of that substance.

The melting point range is affected by a number of factors in addition to that of purity. Particle size, amount of material used, density of packing in the capillary tube, thickness of the capillary tube and the rate of heating of the liquid bath, are all factors that should be carefully considered to ensure an accurate melting point. The rate of heating is the most critical factor

2.	
3.	

Record the melting point ranges for each of the following mixtures:

Melting point range for unknown + (1):

Melting point range for unknown + (2):

Melting point range for unknown + (3):

Unknown is:

QUESTIONS

1) What two effects do impurities have on the melting point of an organic compound?

1. tend to lower the overall melting point of the compound.
2. tend to increase the range of the melting point.

2) For what two purposes are melting points routinely used? (identity)

to characterize organic and inorganic crystalline compound and to ascertain their purity.

3) What effects on the measured melting point would you expect in each of the following cases:

a) Presence of pieces of glass in the sample.

No effect.

b) Presence of solvent within the crystals.

reduced

c) Rapid heating during melting point determinations.

increase the different between Melting point.

d) Using too large a sample when determining the melting point?

longer melting time