

Melting point determination

Melting point determination is a process used in various industrial fields to identify and check the purity of different substances. Melting points are used to define organic and inorganic crystalline compounds and to verify their purity. Pure substances melt at a precise, highly defined temperature, whereas impure, contaminated substances generally have a larger melting interval. The temperature at which all the materials of a contaminated substance are molten is usually lower than that of a pure substance. This behavior is known as **melting point depression** and can be used to obtain qualitative information about the purity of a material.

Melting point determination principles

At the melting point, any substance (both pure and contaminated) has a change in its light transmission. Compared to other physical properties, the change in light transmission can be easily determined and therefore can be used for melting point determination. **Powdered** crystalline materials are opaque in the crystalline state and transparent in the liquid state. This difference can be measured in order to determine the melting point by recording the percentage of light intensity shining through the substance.

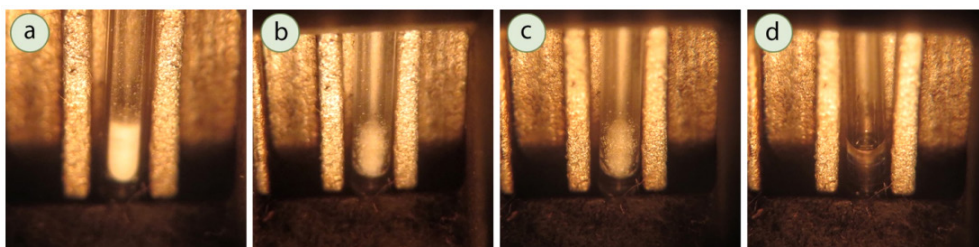
The capillary method

The most common and most basic method of determination, however, is the capillary method. This method consists of placing the **sample** in a capillary tube and running an experiment that will heat the sample until it reaches its melting point.

The experiment is usually performed in thin glass tubes with an internal diameter of 1 mm and a wall thickness of 0.1 – 0.2 mm. A sample is placed in the capillary tube to a filling level of 2–3 mm and introduced into a heated stand, which is close to a thermometer. The temperature in the heating stand is **ramped up** at a fixed rate. The melting process is visually inspected to determine the melting point of the sample.

There are four main stages:

- sintering point**, at which, after being heated, the solid starts pulling away from the wall of the tube;
- collapse point**, at which the substance is still mostly solid but comprises a small quantity of molten material;
- meniscus point**, at which most of the substance has melted but some solid material is still present;
- clear point**, at which the substance has completely melted.



meniscus: *menisco*
powdered: *in polvere*
to ramp up: *aumentare*
sample: *campione*
to sinter: *sintetizzare*

Capillary method for the determination of the melting point

1  Translate the terms.

- | | |
|---------------------|------------------------|
| 1. Tubo: | 6. Molten: |
| 2. Stage: | 7. Intensità: |
| 3. Substance: | 8. To heat: |
| 4. Purezza: | 9. Sintetizzare: |
| 5. Principle: | 10. Verificare: |

2  Decide if the statements are true or false. Correct the false statements.

- | | T | F |
|--|--------------------------|--------------------------|
| 1. Melting point determination is a process used to check the purity of substances. | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Impure substances have a smaller melting range than pure substances. | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. The melting point temperatures of pure substances is lower than that of contaminated substances. | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Powdered crystalline materials are transparent in their liquid state. | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. The capillary method has five main stages. | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. The capillary method experiment is performed in glass tubes with an internal diameter of 2 mm. | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. The first stage of the capillary method is the sintering stage. | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. In the capillary method, the clear point is the temperature at which the substance has completely melted. | <input type="checkbox"/> | <input type="checkbox"/> |