Determination of Melting point

The **melting point** of a substance may be defined as **the temperature at which the substance changes from the solid state to the liquid state**. It is a very useful physical constant because a pure substance melts at a **definite temperature** and has a **sharp melting point** while an impure substance has a lower melting point and melts over a wide range. Therefore, determination of melting point is a very convenient method to check the purity of a solid substance. Moreover, melting point determination can be used to identify a substance by comparing its melting point with the melting points of known substances.

Experiment

To determine the melting point of the given solid substance.

Requirements

100 ml beaker, thermometer, iron stand, clamp, tripod stand, stirrer, thin-walled capillary tube 8 to 10 cm long and 1 to 2 mm diameter, spatula. Liquid paraffin.

Procedure

1. Powder the crystalline substance. Take a capillary tube and seal its one end by heat¬ing (Fig. 3.1). For filling the substance make a heap of the powdered substance on the porous plate. Push the open end of the capillary tube into the heap. Some substance will enter into it.

Now tap the sealed end of the capillary tube on the porous plate gently. Fill the capillary tube up to 2-3 mm.

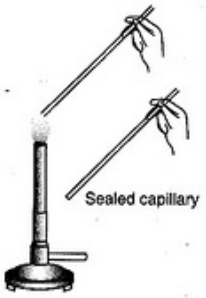

Fig. 3.1. Sealing one end of the capillary tube.

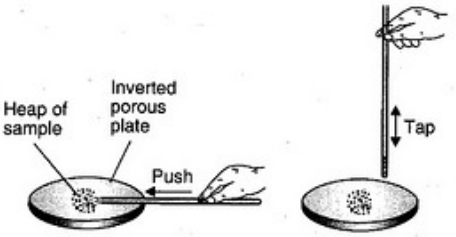

Fig. 3.2. Charging the capillary tube

2. Attach the capillary tube to a thermometer which is immersed in a bath of liquid paraffin. The surface tension of the bath liquid is sufficient to hold the capillary tube in position.

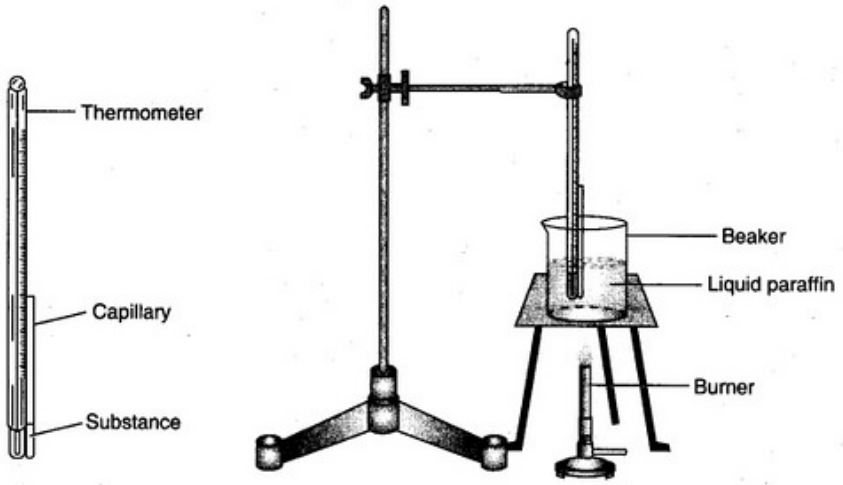

Fig. 3.3. Taking the melting point.

3. Heat the beaker slowly and go on stirring the liquid in the beaker so that the temperature remains uniform throughout. For this, a glass loop stirrer is moved up and down. When the temperature is within 15° of the melting point of the pure substance, the flame is lowered. Now, the temperature is allowed to rise slowly.
4. The temperature is noted when the substance starts melting. The temperature is noted again when it is completely melted. The average of the two readings gives the melting point of the substance.

Precautions

1. Use dry and powdered sample for the determination of melting point.
2. Keep the lower end of the capillary tube and the thermometer at the same level.

3. Packing of the powder should be uniform without any big air gaps in between the solid particles.
4. Heating should be gradual and the bath should be stirred regularly to maintain uniform temperature.
5. The bulb of the thermometer and the capillary sticking to it should not touch the side or the bottom of the beaker.
6. Do not use rubber band for attaching the capillary tube to the thermometer.

Observations

Temperature at which the unknown substance begins to melt = t_1 °C
Temperature at which the substance completely melts = t_2 °C
Melting point of the unknown substance = $\left(\frac{t_1+t_2}{2}\right)$ °C

Table: Melting Points of Some Organic Compounds

Compound	*Melting point* (°C)	*Compound*	*Melting point* (°C)
Phenol	42	Acetamide	82
α -Naphthol	95	Benzamide	128
β -Naphthol	123	Urea	132
Oxalic acid	101	Fructose	103
Benzoic acid	121	Glucose	146
Cinnamic acid	133	Sucrose	160
p-Toluidine	43	Naphthalene	80
α -Naphthylamine	50		