Determination of Boiling point

The **boiling point** of a liquid may be defined as **the temperature at which the vapour pressure of the liquid is equal to the atmospheric pressure exerted upon the liquid surface**.
The boiling point of the liquid depends upon the pressure exerted upon the liquid surface. Since atmospheric pressure is different at different place, therefore a liquid has different boiling points at different places. For the sake of comparison we use normal boiling points. The normal boiling point of a liquid may be defined as **the temperature at which vapour pressure of the liquid is equal to one standard atmospheric pressure (760 mm)**.
The boiling point of a liquid increases if non-volatile impurities are present in it.

Experiment

To determine the Boiling point of the given solid substance.

Requirements

100 ml coming glass beaker, a small thin walled test tube, thermometer, a capillary tube, a tripod stand, wire gauze, stirrer, iron stand with clamp, liquid paraffin or cone, sulphuric acid and the given liquid.

Procedure

1. Take a small test tube and fill it two-third with the given liquid whose boiling point is to be determined. Fix this tube to the thermometer with a rubber band. The rubber band should be fixed near the mouth of the tube so that it remains outside the liquid paraffin bath. Adjust the tube so that the bottom of the tube is somewhere at the middle of the thermometer bulb.
2. Clamp the thermometer carrying test tube in an iron stand through a cork. Lower the thermometer along with the tube into a liquid paraffin bath. Adjust the ther¬mometer so that its bulb is well under the acid and open end of the tube with the rubber band is sufficiently outside the acid bath. .
3. Take a capillary tube 5-6 cm in length and seal it at about one cm from one end by heating it in flame and giving a slight twist. Place this capillary in the test tube so that sealed part of it stands in the liquid.
4. Start hgating the liquid paraffin bath slowly and stir the bath gently. Keep an eye on the liquid and the test tube and also on the thread of the mercury in the thermo¬meter. At first a bubble or two will be seen escaping at the end of the capillary dipping in the liquid, but soon a rapid and continuous stream of air bubbles escapes from it. This is the stage when the vapour pressure of the liquid in the sealed capil¬lary just exceeds the atmospheric pressure. Note the temperature when continuous stream of bubbles starts coming out. Remove the flame and note the temperature when the evolution of bubbles from the end of,the capillary tube just stops. The mean of these two temperatures gives the boiling point of the liquid.

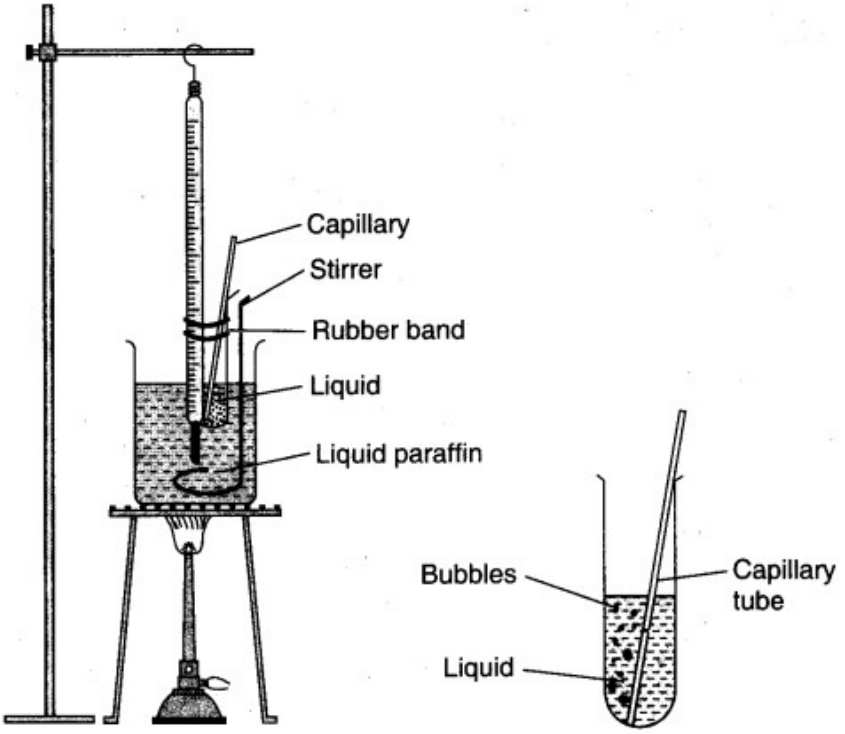

Fig. 4.1. Determination of the boiling point.

5. Allow the temperature fall by 10°C and repeat the heating and again note the boiling point.

Precautions

1. Keep the lower end of the ignition tube and the thermometer bulb at the same level.
2. Record the temperature as the boiling point at which brisk and continuous evolution of the bubbles starts from the lower end of the capillary dipped in the liquid organic compound.
3. If on placing the sealed capillary tube in the test tube, the liquid is seen rising in the capillary tube, it indicates that the capillary tube is not properly sealed. Reject this capillary tube and use a sealed new one.
4. The sealed point of the capillary tube should be well within the liquid.
5. The paraffin bath must be heated very slowly and the paraffin stirred to ensure uniform heating.

Note. Paraffin can be safely heated upto 220°C while conc. H_2SO_4 can be heated upto 280°C.For finding the melting points of solids, having lower melting points, liquid paraffin may be used while for solids having melting points greater than 200°C conc. H_2SO_4 may be used.

Observations

Boiling point

(i) t_1 °C

(ii) t_2 °C

Mean = Formula does not parse = t°C

Table: Melting Points of Some Organic Compounds

Compound	Boiling point (°C)	Compound	Boiling point (°C)
Benzyl alcohol	205	Ethyl benzoate	212
Glycerol	290	Methyl salicylate	223
Ethylene glycol	197	Nitrobenzene	211
Phenol	182	Aniline	184
o-Cresol	190	o-Toluidine	200
Benzaldehyde	179	Chlorobenzene	132
Acetophenone	202	Bromobenzene	157
Phenyl acetate	196	Benzoyl chloride	197