

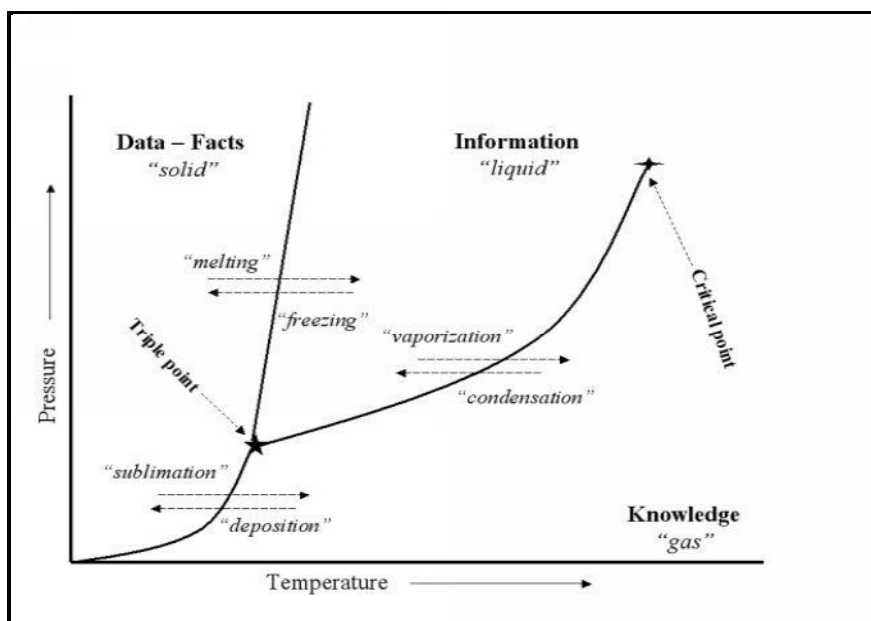
Sublimation

Purpose of experimental

Purification of solid sublimed substances (naphthalene)

Theory part of experimental

Sublimation is the transition of a substance directly from the solid to the gas phase without passing through the intermediate liquid phase. Sublimation is an endothermic phase transition that occurs at temperatures and pressures below a substance's triple point [In thermodynamics, the **triple point** of a substance is the temperature and pressure at which the three phases (gas, liquid, and solid) of that substance coexist in thermodynamic equilibrium] as in its phase diagram.



Phase diagram thermodynamic equilibrium

The reverse process of sublimation is desublimation or deposition, in which a substance passes directly from a gas to a solid phase. At normal

pressure, most chemical compounds and elements possess three different states at different temperatures. In these cases, the transition from the solid to the gaseous state requires an intermediate liquid state. So, all solids that possess an appreciable vapor pressure at a certain temperature usually can sublime in air (e.g. water ice just below 0 °C). Sublimation is much easier than evaporation from the melt, because the pressure of their triple point is very high, and it is difficult to obtain them as liquids. Sublimation requires additional energy and is an endothermic change.

Example of compounds that are purified by sublimation: camphor, benzoic acid, naphthalene, salicylic acid and the quinines.

Conditions of sublimation

1. The chemical has a triple point
2. Heating should be quiet

Chemical and Apparatus

Beaker, watch glass, hotplate, glass rod, filter paper, cold water or ice, naphthalene contaminated with sand, balance

Procedure of experimental

1. Place a mixture of 1 gm. of one of the sublimed substances (impurity naphthalene with sand) in a 200 ml. beaker, covered with a round bottomed flask filled with cold water or ice.
2. The beaker is placed on a hotplate or a low flame.
3. The sublimed substance (i. e. the naphthalene) will collect on the bottom of the cold flask and on the side walls of the beaker in pure, crystalline form.

Experimental No. (5)

Sublimation

4. Scrape the sample of sublimed material from the flask and beaker.
5. Collect in a small flask , weigh, and determine the M.P. of the pure substance . Compare to the original sample .

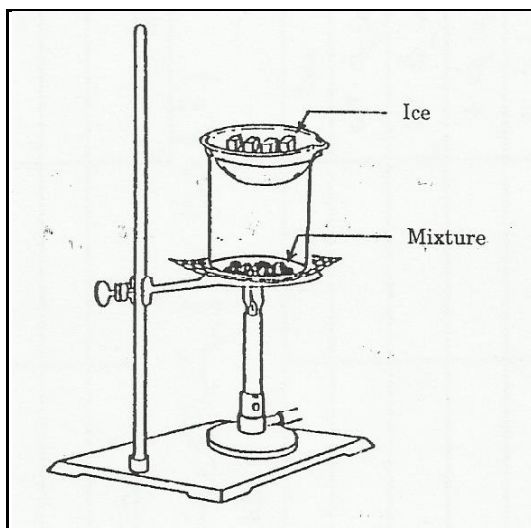


Figure shows the experience of sublimation

Calculations

$$\% \text{ Yield} = \frac{\text{Weight of product} \times 100}{\text{Weight of sample}}$$

Questions for discussion

- 1- Define the following: sublimation, triple point
- 2- What is the different between sublimation and desublimation or deposition
- 3- What is the compounds which purification by sublimation
- 4- Draw the Phase diagram thermodynamic equilibrium
- 5- Why we using the ice in the sublimation experimental