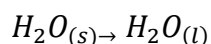


Experiment 4. Determination of latent heat of fusion of ice L_{fus}

Introduction

Ice fusion is the transition of water from a solid to a liquid form, which requires the absorption of heat energy and occurs at a constant temperature.



Latent heat of fusion L_{fus}

The latent heat of fusion of ice is the thermal energy needed to convert a mass of ice at its melting point into water at the same temperature without changing its temperature. The unit for latent heat of fusion is kilojoules per gram (kJ/g), and it is expressed by following equation :

$$L_{fus} = \frac{Q}{m}$$

Where:

- L_{fus} : The latent heat of fusion
- Q : The heat energy
- m : Matter mass

The enthalpy of fusion ΔH_{fus}

The enthalpy of fusion is the heat energy needed to change one mole of a substance from solid to liquid, and it is expressed by following equation :

$$\Delta H_{fus} = \frac{Q}{n} = L_{fus}, M$$

The objective of the experiment

This experiment aims to determine the latent heat and enthalpy of fusion of ice L_{fus} and ΔH_{fus} using a calorimeter.

Materials and Chemicals

Materials

- Calorimeter with mixer
- Thermometer
- Becher
- Analytical balance

Chemicals

- Distilled water
- Pieces of ice

Experimental Procedure

1. We place ice pieces in a beaker of distilled water, let them to reach thermal equilibrium, then test the resulting temperature to ensure it is $T_0 = 0^\circ\text{C}$.
2. We take a becher and ignore its weight before filling it with $m_1=200\text{ g}$ of cool water.
2. Put the cold water into the calorimeter.
3. We close the calorimeter and wait for thermal equilibrium to be achieved, and take a temperature reading of the system (cold water + calorimeter), let it be T_1 .
4. We take out pieces of ice from the beaker and wipe them quickly with a paper napkin, we weigh them and put them in the calorimeter, monitoring by means of a thermometer the drop in temperature resulting from the melting of the piece of ice.
5. We close the calorimeter and wait for thermal equilibrium to be achieved, and take a temperature reading of the system (cold water + ice + calorimeter), let it be T_{eq} .
6. Record the obtained results in a table.

Questions

1. Calculate the heat of fusion of ice.
2. Calculate the latent heat of fusion of ice.
3. Compare the experimental and theoretical values.
4. Calculate the enthalpy of fusion of the ice.
5. Predict the reaction type, and justify.

We give :

The theoretical specific heat values of ice $L_{fus} = 335\text{ J/g}$

The calorimeter thermal capacity $K_{\text{cal}} = 61.51\text{ J/g.K}$

The specific heat of water $C_{\text{H}_2\text{O}} = 4.185\text{ J/g.K}$