Specific latent heat

Transcript

The amount of thermal energy required to convert one kilogram of a substance from the solid phase to the liquid phase, whilst maintaining a constant temperature, is known as the specific latent heat of fusion.

In this experiment, an immersion heater will be used to determine the specific latent heat of fusion of ice.

For this experiment we will heat ice and collect the melted water in a beaker to establish the specific latent heat of fusion of ice.

First the mass of the empty beaker must be measured.

An immersion heater is fully covered in ice inside the funnel. This is placed above the beaker.

An ammeter will measure the current from the power supply and a voltmeter will measure the potential difference across the immersion heater.

These values will allow us to calculate the electrical energy provided by the immersion heater to the ice.

It should be considered that if the ice were not heated by the heater it would still melt, but at a slower rate, due to the heat energy supplied by the air.

The energy provided by the air cannot be measured, but a control can be set up simultaneously so that the amount of ice that melts in the same time can be compared.

To make sure the control is set up identically to the experiment, we should compare the drip rates of both set ups before we turn on the immersion heater.

These drip rates should be the same.

The immersion heater is turned on and the stop clock started.

Readings of current and potential difference need to be recorded. These should be constant.

When finished, record the time for which the immersion heater is on.

The drip rates must be equal before measurements of the mass of the water can be made.

The mass of the beaker and the melted water is found.

In both cases the mass of the water can be found by subtracting the mass of the beaker from the mass of the beaker with the water inside.

The mass of water that was melted due to the immersion heater (m_{heater}) can be found by subtracting the mass of the water in the control ($m_{control}$) from the mass of the water melted from the funnel with the working immersion heater (m_{total}).

To calculate the specific latent heat of fusion we will use our recorded measurements of mass, time, current and voltage.

The electrical energy (Q) given to the ice by the immersion heater can be calculated by multiplying together the current (I), time (t) and potential difference (V).

Assuming all of the electrical energy from the immersion heater is transferred to the ice, the specific latent heat of fusion (L) can be calculated by dividing the electrical energy already calculated (Q) by the mass of the water that was melted (m).

Why is it important for there to be a control in this experiment?

Why must we wait for the drip rates to match after the experiment before taking measurements of mass?

What other sources of error are there in this experiment?