H.U. MECHANICAL ENGINEERING

GENERAL CHEMISTRY LAN REPORT

DETERMINATION OF SPECIFIC HEAT OF A METAL

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The purpose of this experiment is to find the specific heat (c) of copper metal by energy change.

Temperature is a value expressing the average kinetic energy of a substance. Heat is not energy. It is measured with a thermometer.

Temperature value conversions;

metin içeren bir resim

Açıklama otomatik olarak oluşturuldu

Heat transfer is from the place of high temperature to where there is low temperature. Transfer continues until thermal equilibrium is achieved.

The system is the part examined, the surroundings is all parts outside the system.There are three types of systems. In an open system, energy and matter can enter and exit.In a closed system, energy enter and exit and no matter.In isolated system there is no energy and matter input and output. For example, a cup of coffee (open system), a bottle of water (closed system ) and thermos (isolated system).

Heat is the energy that must be transferred to a substance of mass “m” to change its temperature as “delta t”. The symbol of heat is “Q”. The unit of heat is calories or joules and 1 calorie = 4.18 J.

**Q** = cmaterial.(mass)material.(Tfinal-Tinitial)material

Specific heat and is different for each substance. The symbol of specific heat is “c” .It is the amount of heat energy required to raise the temperature of 1 gram of substance by 1°C. The unit of specific heat is cal / celsius.gr . (Specific heat of water = c(water) = 1 , Specific heat of copper = c(copper) = 0.1)

Density is the amount of substance per unit volume. The symbol of density is “d”. The unit of density is g/cm3.( The density of water between 20-25 ° C is d(water) = 0.998 and 1ml = 1cm3.)

**d = m/v**

Conservation of Energy:

If T(final)> T(initial), heat (q) is taken in by the system.

If T(final)> T(initial), heat (q) is sent to the environment by the system.

**Q** sys + **Q** surr **=0**

**Q** sys = **Q** surr

Heat capacity is the amount of heat required to change the temperature of a substance by 1°C. The symbol of heat capacity is “C”. The unit of heat capacity is cal / celsius.

**Q =C.∆T**

Calorimeter is used to find the specific heat of a substance. Heat lost by the hot object Equal to the heat gained by cold waterin scaler.

Data of the experiment:

* Massof the metal (mm)= 0.64 g
* Temperature of boiling water=96°C
* Volume of water in the test tube(Vsu) = 10 mL
* Initial temperature of water in the test tube(t1water) =23°C
* Final temperature of water in the test tube(t2water) =25°C
* Final temperature of metal = Final temperature of water in the test tube
* Initial temperature of metal = Boiling temperature of water

Calculations of the experiment:

What is the specific heat of the metal ? ( c(theoretical of copper) )

What is the deviation rate in the experiment ? ( % Error )

metin içeren bir resim

Açıklama otomatik olarak oluşturuldu

Results of the experiment:

* Change in the temperature of water in the test tube (°C),delta 2°C
* Weight of water in the test tube (g) 9,98 g
* Quantity of heat absorbed by the water (cal) 19.96 cal
* Quantity of heat lost by the metal (cal) 19.96 cal
* Change in the temperature of metal (°C),delta T 71°C
* Specific heat of the metal (cal/g. °C) 0,439cal/g°C

What we are aiming to accomplish in this experiment is to find the specific heat of the metal with a mass of 0.64g. The metal is suspended the balloon with the help of stirring rod without dipping it in water. We kept it on the metal balloon at the boiling point of water for 5-10 minutes. On the other hand, we put the metal into 10 ml of 23 °C water prepared before.We waited for metal and water to come to thermal equilibrium. In our measurement , we measured that it reached thermal equilibrium at 25 °C. As a result, we found the theoretical specific heat of the metal to be 0.439 cal/g°C.

Another aim is to find the deviation amount of the actual specific heat of the metal with the value we found and we found 339% deviation but this value is quite high.

The first reason may be that we measured it incorrectly with a weighing. We might have measured the amount of water wrong with the measuring cup. There may be an error at 23 °C, 25 °C and 96 °C that we measured with the thermometer. Equipment can be rechecked for accurate results.

Another reason may be that the metal standing in water vapor did not reach 96 °C so the expected time may not be enough Metal should be kept in water vapor for a long time for accurate results.

The last reason, we did not take into account the heat lost during immersion in 10 ml of water by taking the metal from the water vapor. For accurate results, very short-term heat transfer with the environment should be taken into account.

If we pay attention to these parameters, a more accurate result will come out.

Referenced sources:

Websites:

<https://tr.wikipedia.org/>

<https://fizikdersi.gen.tr/>

<https://tr.bccrwp.org/>

Books:

General Chemistry Principles And Modern Applications (10th Edition, Chapter 7-1 and 7-2).

Questions & Answers:

What is the difference between specific heat and heat capacity?

The main difference between heat capacity and specific heat is that the heat capacity depends on the amount of material while the specific heat capacity is independent.