**Experiment 12 Heat of Neutralization**

Atik Howlader

Department of Chemistry and Biochemistry, Queens College – ***CUNY***

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**Abstract**:

For this experiment, the goal was to determine the heat of a neutralization reaction. The methods used in the experiment was using a calorimeter to obtain calorimetric data of the soultion in the calorimeter. The results of the experiment produced the final temperature of – 50.208 Kj/mol for HCl and -52.3 Kj/mol for H2SO4.

**Introduction**:

In this experiment, a calorimeter was used to measure the final temperature of chemical reaction. A neutralization reaction, which is an exothermic reaction takes place in the experiment. An exothermic reaction is when the reaction can release heat to the surroundings, so a temperature of the acids/base before the reaction was taken and after the reaction the temperature of the solution was taken. The method used to calculate the goal (ΔH) is ΔH= -[ mtsw + Ccal)] (Tf – Ti).

**Materials**:

* Calorimeter
* Thermometer
* Hot Plate
* Metal Beaker
* 100 mL Graduated Cylinder
* Plastic Wash Bottle
* Distilled Water
* Ruler

**Methods**:

1. Calorimeter was formed by placing one Styrofoam cup on top of another Styrofoam cup
2. 40.0 mL of 1.0M aqueous hydroclhloric acid is measured using the graduated cylinder and then poured into a beaker
3. 20.0 mL of 2.0M aqueous sodium hydroxide is measured using the graduated cylinder and then poured in the calorimeter
4. Using the thermometer, the temperature of both the acid and the base were measured and then recorded into data table
5. The acid solution was then poured into the calorimeter containing the base solution and then was immediately closed with a lid
6. Then temperature was immediately monitored by sticking the thermometer through the lid of the calorimeter
7. Once the solution reached its final temperature record the temperature into the data sheet
8. Then repeated steps 4-7 using 20 mL of 1.0 M aqueous sulfuric acid instead of aqueous hydrochloric acid
9. Did this for two trials worth of data for both acids

**Results**:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | HCl | H2SO4 | HCl | H2SO4 |
| Volume of acid | 40 mL | 20 mL | 40 mL | 20 mL |
| Temp of acid | 23 °C | 23°C | 22°C | 23°C |
| Volume of base | 20 mL | 20 mL | 20 mL | 20 mL |
| Temp of base | 25°C | 24°C | 24°C | 24°C |
| Final temperature | 32°C | 36°C | 31°C | 36°C |

**Calculations**:

ΔH= -[ mtsw + Ccal)] (Tf – Ti)

ΔH= -(60 mL)(4.184)(32-24)

ΔH= -2.00832/0.04

ΔH= -50.208 Kj/mol

**Discussion**:

The results of the experiment should have produced the ΔH. The ΔH that was produced from the experiment was -50.208 Kj/mol for HCl and -52.3 Kj/mol for H2SO4. These were produced using the equation ΔH= -[ mtsw + Ccal)] (Tf – Ti). The ΔH for H2SO4 had to be divided by 2 because it was a 1:2 reaction. The Ccal that was used was 4.184 because that was the most accurate reading from a group’s experiment from the last lab. Some errors that could have occurred was not cleaning the thermometer after getting the temp for the base and before monitoring the temperature of the reaction. This could have caused the reaction to occur before the acid was mixed into the base, which would have messed up the temperature reading for the reaction.

**Conclusion**:

In conclusion of the experiment, the goal to find the ΔH was achieved. The ΔH that was produced was -50.208 Kj/mol for HCl and -52.3 Kj/mol for H2SO4. To avoid any possible source of error the ones conducting the experiment should always clean the thermometer before taking the next measurement of temperature to avoid inaccurate measurement for temperature and measurement of volume should be done by the person with the steadiest hands to avoid using too much or too little of an acid/base.