Experiment 12: calorimetry and hess’s law

Science, Physics

Experiment 12: Calorimetry and Hess’s Law Purpose: The purpose of this lab is to determine the enthalpy of reaction for the burning of one mole of magnesium in oxygen. Although the reaction is exothermic, the âˆ†HRXN will be determined by using calorimetry and then using Hess’s Law to manipulate the data collected to yield the answer needed. Procedures: Dillon, Stephanie. “ Calorimetry and Hess’s Law. " Laboratory Manual. Pearson Publishing, 2012, pp. 168-177. Data and Results Part A Volume of cold water | 49. 9 mL | Temperature of cold water (in cup) | 23. 50 C | Volume of hot water | 49. 9 mL | Temperature of hot water(in cup) | 550 C | Part A Calculations Mass of cold water | 49. 9 g | Tf from graph by extrapolation | 34. 90 C | âˆ†THW for hot water | -20. 1 | âˆ†TCW for cold water | 11. 4 | qHW for hot water | -4196. 5 J | qcw for cold water | 2380. 1 J | qCal for the cup | 1816. 4 J | Ccup for the cup | 159. 3 J | Part B Description of sample | Metal fizzed when dissolved in HCl | Volume of HCl | 100 mL | Initial Temperature | 220 C | Mass of Mg | 0. 1485 g | Part B Calculations Tf from graph | 50 C | Mass of HCl | 100 g | âˆ†TCW for HCl | -2092 J | qHCl for solution | -204. 4 J | qCal for cup | -2296. 4 J | qRXN | -47594 J | âˆ†HRXN for Mg | | NET REACTION: 2HCl(aq) + Mg(s)â†’MgCl2(aq) + H2(g) Part C Description of sample | | Volume of HCl | 100 mL | Temperature of HCl | 220 C | Mass of MgO | 0. 5052 g | Part C Calculations Tf from graph | 240 C | âˆ†TCW for HCl | 1. 50 C | qHCl for HCl | 627. 6 J | qCal for cup | 61. 32 J | qRXN | 608. 92 J | âˆ†HRXN for Mgo | 55469 J/mol | Net Equation: 2HCl(aq) + MgO(s)â†’MgCl2(aq) + H2O(l) Calculations: Conclusion: In this experiment we had to find the heat capacity of the calorimeter cup using two trials of hot and cold water. When we obtained the data after 10 minutes of recording 30 second intervals of the calorimeter cup

temperature, we created a line graph to show the trend line. With the trend line, we could figure out the final temperature and delta H in the process. With the equation we could find the heat of reation for hot water q HW = m c DTHW and using qCW = m c DTCW we could find the heat of reaction for cold water. By using | qHW| = | qCW |+ qCal, we can find the heat of reaction of the cup and multiply that by the change in temperature to find the heat capacity. After placing Mg into HCl and then the same thing with MgO, we could find the heat of solution of HCl with q CW = m c DTHCl. When we found the values of DHRxn for B and C we can use Hess's Law, which is shown in the calculations section. All the data is in the data section of the report. The percent error of Mg was about 30%. The actual value of Mg was 601200 J/mol and the experiment we obtained was 420611 J/mol. There could have been human error in order to obtain the results that could have accounted for the 30% error, although this is not so high. Also, the heat of formation we used was MgO(s) for the actual value, although in the experiment it was a gas. This could have also accounted for some error.