Sparkler investigation lab essay sample

Science, Chemistry

Lab Safety:

* Chemical Safety: watch out for any spills, keep the area clean * Heat Safety: stay at a safe distance from the flame

* Sharp Object Safety: take caution when working with magnesium wire * Safety glasses: in case of splashes from the chemicals * Horseplay will not be tolerated

Purpose: The purpose of this lab is to find the enthalpy of combustion of Magnesium. In other words the purpose of this experiment is to determine the enthalpy of formation of magnesium oxide. Background Information:

Sparklers are a type of handheld firework that burns for about a minute while giving off little sparks. They are composed of two fuels, an oxidizer, and pyrotechnic colors (to add visual interest). There’s also a compound that holds them together, either dextrin or nitrocellulose. However, the most important component to a sparkler is the magnesium. The function of the magnesium in sparklers is to provide the bright light to the sparkler. When magnesium is burned it gives off this bright white light, which makes the sparkler glow. Certain regulations to sparklers and firecrackers exist because of how dangerous they can be. According to the American Pyrotechnic Association, in the state of Georgia, a person must be 18 or older to purchase any firework.

Also, Georgia does not allow any firework that explodes or shoot into the air, however sparklers, poppers, or any noisemaker is allowed. Numerous accounts of accidents from sparklers occur every year because sparklers burn at very high temperatures and very quickly. During the month of July

there was a higher accident rate. There were 1, 100 cases of children getting burned from sparklers, and 1, 100 cases of fireworks also. MgO(s) + 2HCl(aq) = MgCl2(aq) + H2O(l) and also Mg(s) + 2HCl(aq) = MgCl2(aq) + H2(g). This reaction would be exothermic because it is releasing heat and the final temperature is higher than the initial temperature. The accepted value for the enthalpy of combustion of magnesium is -602 KJ/mol.

Heat of Combustion of Mg Data Table

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Balanced Equation| Reaction| Type of Reaction| Data|
H2(g) + 1/2O2(g) = H2O(l)| Formation of liquid water from its elements| Synthesis| Hf=-286KJ/mol| MgO(s) + 2HCl(aq) = MgCl2(aq) + H2O(l)| Solid magnesium oxide reacts with aqueous hydrochloric acid| Double Replacement| Hr= -133 KJ/molInitial: 20. 0 CFinal: 27. 9 C| Mg(s) + 2HCl(aq) = MgCl2(aq) + H2(g)| Magnesium metal is added to aqueous hydrochloric acid| Single Replacement| Hr=-168 KJ/molInitial: 19. 8Final: 27. 7Mass: . 388g| Data Analysis:

A. Determine the heat produced or absorbed when MgO(s) is reacted with HCl (aq). This is Reaction 2.

B. Determine the heat produced or absorbed when Mg(s) is reacted with HCl(s). This is reaction 3.

C. Using Hess’s Law of Heat Summation and the balanced equations for the three reactions, calculate the enthalpy of reaction for the combustion of magnesium.

D. Compare the experimental value for the enthalpy of combustion of magnesium t the accepted value that was found during preliminary investigation. Calculate the percent error of the experimental data.

E. A sparkler contains 0. 11g of magnesium. If all of the magnesium in a sparkler reacts, how much heat is the sparkler capable of producing as it burns? Use the experimental.

Summary:

Paragraph #1: The purpose of this investigation was to find the enthalpy of combustion for Magnesium. A series of chemical equations were used to find the enthalpy of combustion for Magnesium. Procedures performed during the course of this experiment were divided under three categories: Reaction of HCl with MgO, HCl with Mg, and Oxygen with Hydrogen. In the reaction of oxygen with hydrogen, find the heat of formation of one mole of liquid water from the element writing a balanced equation. In the reaction of HCl with MgO, measure 100. 0 mL of hydrochloric acid and add it to a calorimeter, which is an instrument used to help find the heat of a reaction, and then add 1. 00 g of magnesium oxide. Stir and record any temperatures, (initial and final). In the reaction of Mg with HCl, pour 100. 0 mL of hydrochloric acid into the calorimeter, and then place the magnesium ribbon into the calorimeter and stir. Stir the substance in the calorimeter until the highest temperature is recorded. A calorimeter, as stated earlier, measures heat capacity. In this lab the calorimeter was Styrofoam cups placed on top of one another at the rims.

Paragraph #2: Scientists collect two types of data: qualitative and quantitative data. Qualitative data is field of investigation that answers the why and how of the experiment. Qualitative data is collected based off of scientist’s senses. Contrariwise quantitative data is numeric data meaning it can be measured. Some examples of qualitative data in the motion of atoms and molecules lab include the white color and the soft texture of the MgO. This also includes the silver color of the Mg ribbon and the transparency of the HCl. The quantitative data in this experiment was measured using a thermometer and a balance. The quantitative include increase of the initial temperature of HCl from 20. 0 degrees Celsius to 27. 9 degrees Celsius after magnesium oxide was added to the HCl. It also includes the19. 8 degrees Celsius of the initial temperature of the HCl and then 27. 8 degrees Celsius after the Mg strip was added to the solution. Additional quantitative data includes the heat of formation of water at -286KJ, the heat of reaction of MgO with HCl at -133KJ, and the heat of reaction of Mg with HCl at -168KJ.

Paragraph #3: In this experiment the heat of combustion could not be collected due to the fact that the resources needed to measure the enthalpy of combustion were not provided. In order to overcome this obstacle, students used the heat of reaction of three chemical equations. Using the heat of reaction the students used Hess’s Law of Heat Summation to find the heat of combustion. To find the enthalpy of the reaction, we add the enthalpy changes for a series of reactions. The reaction q= mc(delta)T is used to calculate the amount of heat gained or lost during a reaction. Q stands for the heat created or lost, m stands for the mass of the reactant, c is the specific heat of the reactant and T is the change in temperature.

During this experiment, a calorimeter was used. Ideally, the calorimeter would not allow any heat to enter or escape. This allows for accurate temperature readings.

During this experiment our group faced large a percent error. Our percent error was 48. 8%. After discussing what the possible reason for such a large percent error with group mates and an instructor we have concluded that the balance was the cause of such a large percent error. The mass of our Mg wire was . 39 grams where other groups had about . 1 grams of Mg wire. The calorimeter does not allow heat to escape; however a calorimeter made of Styrofoam was used, which could contribute to the percent error because there maybe small holes in the cups or the top cup may have could have come off during the reaction. The use of a one-piece calorimeter could possibly reduce the percent error. In massing the substances students could compare their masses with other groups before proceeding with the experiment to ensure that no groups are straying from the norm. Stirring the solutions longer could also assist in reducing the percent error.