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Chem 1045 Lab

Stoichiometry

Introduction

In the laboratory experiment, the optimal ration of reactants will be determined by monitoring the temperature change. When household bleach (solution of sodium hypoclorite) is allowed to react with hydrogen peroxide, the temperature of the mixture is greater than the individual reactants. That is, an exothermic reaction will occur upon mixing which means that one of the products is energy. Determine the maximum temperature change.

Procedures

1. Obtain a bottle of hydrogen peroxide solution and a bottle of sodium hypochlorite solution from the instructor.

2. Remember to record any general observations including concentrations.

3. Place a stir plate on a ring stand.

4. Clean and dry a Styrofoam coffee cup.

5. Place a stirbar in the coffee cup.

6. Place the coffee cup on a stir plate securing the cup to the ring stand with a three prong clamp.

7. Using a graduated cylinder, place the appropriate volume of hydrogen peroxide in the coffee cup, replace the lid, and stir.

8. Lower the temperature probe into the coffee cup through the lid being careful not to allow the stirbar to hit the temperature probe.

9. Begin recording the temperature. Make a note of the initial temperature on your data sheet.

10. Using a different graduated cylinder, measure out the appropriate volume of sodium hypochlorite.

11. Carefully slide the lid up the temperature probe and add the sodium hypochlorite to the coffee cup. Slide the lid backdown and seal the cup. The temperature of the mixture will increase and then level off.

12. Once the temperature starts to decrease, record the highest temperature.

13. Using the tools present determine the maximum temperature obtained from the mixture and record this value on your data sheet.

14. Determine the temperature chance (maximum temperature- initial temperature).

15. Dump the contents of the coffee cup in the sink being careful not to lose the stirbar and thoroughly rinse and dry the coffee cup and stirbar.

16. Rinse and dry the temperature probe.

17. Repeat steps 4-16 until all the data runs are completed.

18. Repeat any data run as needed.

Data Results



Conclusion

The optimal ratio of the reaction was the 12 mL of Hydrogen Peroxide and 28 mL Sodium Chlorite, causing a 10. 3 C temperature difference from initial starting temperature until the maximum combined component temperature. It seems as though after this point, there was too little amount of Hydrogen Peroxide in mL to cause a significant reaction.

Post lab Questions

1. What did you group determine to be the optimal ratio of the reaction?

The optimal ratio of the reaction was the 14 mL of Hydrogen Peroxide and 26 mL Sodium Chlorite, causing a 10. 3 C temperature difference from initial starting temperature until the maximum combined component temperature.

2. Would this procedure work for an endothermic reaction?

Yes, I would be able to use the same procedure to measure endothermic reactions as long as the components were contained. Endothermic reactions absorb heat so one chemical would be absorbing heat from another chemical, thus causing the combined solution to rise in temperature.

3. Why was the total volume kept constant?

The total volume was kept constant so that the total volume of the solution would not be a variable. Since it was not a variable we were able to determine the difference in temperatures without using a percentage to determine the actual difference.

4. Besides the change in temperature was there any other evidence a chemical reaction took place? If so, what evidence?

Yes, without even knowing there was a change in temperature, when both chemicals were combined they boiled and released a gas. The chemicals combined caused heat, enough heat for the solution to boil.

5. If the solutions were not stirred, would you have obtained the same results? Explain?

Stirring the solution caused the chemicals to be combined more quickly and evenly. The results might have varied but only slightly if the chemicals were solely poured into each other.

6. What sources of error are there in this experiment?

The thermometer used should have been digital to determine a more accurate reading.

7. How would you improve this experiment?

I would improve this experiment by using a glass container because the Styrofoam container absorbs some of the heat. The experiment could have also been improved if a digital thermometer was used.