CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
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Project Number
S1514

Project Title
Chemiluminescence: Determining the Efficiency of Light Production by Luminol

Abstract

Objectives/Goals
In my experiment, I will determine efficiency of light production by luminol in an aqueous solution with hydrogen peroxide as the oxygen donor and iron as a catalyst in the form of potassium ferricyanide.

Methods/Materials
METHOD:
I produced luminol in my high school lab. Then I divided the luminol into 2 equal amounts for two separate reactions. The first reaction took place in a calorimeter and measured the total energy evolved. The second reaction took place in a glass beaker in a totally dark room and measured the illuminescence of the reaction. Once illuminescence was converted to light energy, the light energy was divided by the total energy evolved by luminol resulting in the efficiency of light production.

MATERIALS:
3-nitrophthalic anhydride Hydrazine sulfate Hydrated sodium acetate Glycerol Boiling chip Thermometer NaOH (10% solution) Sodium hydrosulfate Glacial acetic acid Potassium ferricyanide [K3Fe(CN)6] Hydrogen peroxide (3%) (commonly obtained) HCl Laptop Vernier Lab Equipment (Lab Pro, digital thermometer, light meter)

Results
According to my results approximately .0180% of the energy generated by luminol will escape the system as light. There may be more light created, but it will only heat the solution of the system or be absorbed or transformed into heat somehow.

Conclusions/Discussion
I feel that I learned a lot from this experiment not only about chemiluminescence and light conversion, but also about how to do a better experiment. I was able to pull together information from many different sources and devise a method for measuring an abstract value. Even though there were many variables associated with this project, I feel that for future experiments I now have the knowledge needed to properly access such variables.

Summary Statement
I determined the percent of total energy released by luminol that is converted into visible light.

Help Received
I would like to acknowledge Mr. Ferazzi for his aid in steering me toward chemiluminescence, providing me with the procedure on how to render luminol, and for giving me all the necessary lab equipment and time. I would like to thank Dr. Biessmann of the UCI Developmental Biology Center for providing me