CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
Rishi Shah

Project Number
35077

Project Title
Energy from C(2)H(5)OH / H(2)O(2)

Abstract

Objectives/Goals
To determine if the energy released by ethanol is increased when mixed with various concentrations of hydrogen peroxide: 95% ethanol 5% H2O2 v/v, 90/10 v/v, 85/15 v/v, 80/20 v/v.The control was water. I hypothesized that addition of H2O2 will increase the energy released by the ethanol.

Methods/Materials
The change in the temperature of 50mls of water was measured after it was heated for 60 seconds by the ethanol/ hydrogen peroxide blends. The procedure was repeated 5 times for each of the different samples.

Results
The heat energy transferred by the ethanol / hydrogen peroxide blends to the water was calculated using the Heat Formula: Q = m x c x delta T ,where Q= Energy (J), m= mass of water (g), c= specific heat capacity of water (J/g°C), delta T = change in temperature of the water (°C). The Heat of Combustion (J/mol) = Q/moles ethanol used.
My results are the average heat of combustion for Ethanol/ H2O2 (kJ per mole): 5%: 380.124, 10%: 365.077, 15% : 417.355, 20%: 411.745. Average heat of combustion of Ethanol with control H2O (kJ per mole): 5%: 417.062, 10%: 426.618, 15%: 348.958, 20%: 372.821.

Conclusions/Discussion
My hypothesis was supported at 15% and 20%, but not at 5% and 10%. Lower results at 5% and 10% compared with the control may be because the decomposition of hydrogen peroxide is concentration dependent. Errors due to heat loss were minimized by surrounding the apparatus with polystyrene foams wrapped in several layers of aluminium foil. Also, the heat absorbed by the apparatus was not taken into account in the calculations. Next steps of the project would be to: determine the octane numbers of ethanol with H2O2; investigate if combustion of ethanol with H2O2 is environmentally friendly and the effects it might have on vehicles.
Incorporating H2O2 to the current ethanol and gasoline blends in vehicles can make them more efficient.

Summary Statement
The purpose was to determine if the energy released by ethanol is increased when mixed with hydrogen peroxide.

Help Received
My mom helped me: get materials and supplies; supervised and properly disposed of the hazardous materials; proofreading my report and putting the display board together.