CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
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Project Number
S0526

Project Title
Hydrofoam: Changing the Way the World is Powered

Abstract

Objectives/Goals
To make the use of hydrogen as an energy resource safer and more versatile to prevent pollution. To determine the combustibility of hydrogen foams made up of specific bubble sizes. To determine effects of solution chemistry on the foam (absorption, diffusion, combustion, and electrochemistry). To compare the propulsion of the combustion of Hydrofoam to that of hydrogen gas (using rockets). To test the absorption of Hydrofoam and compare it to that of hydrogen gas for safer storage possibilities (using open-ended monometers). To run a generator engine on Hydrofoam. To power a hydrogen fuel cell on Hydrofoam.

Methods/Materials
Use a hydrogen tank and various filters to create hydrogen foams in fire-fighter foam solutions. Create bubble sizes in each foam solution in .5mm increments from .5mm on. Ignite foams and evaluate combustibility. Additional experiments were conducted in Hydrofoam versatility by: 1) Making Hydrofoam rockets. 2) Testing hydrogen absorption. 3) Adding materials to the solution to increase combustibility. To run combustion engine on Hydrofoam, the foam must be created at pressure and propelled to the engine.

Results
Hydrogen foams range in combustibility from noncombustible in bubble sizes up to 5.5mm to explosive at approximately 20mm. Rates vary for different solutions (A, B and Joy). The Hydrofoam rockets went about the same height as the hydrogen gas rockets. There appeared to be no difference in the amount of absorption between the foam and the gas. Using additives to increase combustibility of solution did not work because all reacted with the solution making it unable to foam. Hydrofoam was created at pressure to propel itself through piping. The engine was powered by Hydrofoam. The fuel cell has a system designed to power it on Hydrofoam and will be running hopefully soon.

Conclusions/Discussion
The rate of hydrogen foam's combustion is directly related to the bubble size in the foam. Hydrogen foams can be physically and chemically altered for different applications of combustion and chemical reaction rates. Hydrofoam can be used to power generators and hydrogen fuel cells. It could be used as a safety precaution in the system before entering an adjustment phase. The largest issue with powering the fuel cell on Hydrofoam is that the foam would need to be transformed back into pure hydrogen gas in order to power the fuel cell.

Summary Statement
Controlling the combustion rate of hydrogen by making it into a foam and controlling the bubble size within the foam.

Help Received
Father helped oversee the early experiments and helped get some of the materials.