CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)	**Project Number**
Marcus X.S. Luebke	**J0620**

Project Title

Running on Water: Optimizing Hydrogen and Oxygen Production from Water to Power Cars

Abstract

Objectives/Goals

The objective of this research is to maximize hydrogen production via optimization of water electrolysis and see if I can create a design to continuously produce enough hydrogen fuel to run a car as an alternative to gasoline.

Methods/Materials

I measured hydrogen production by adjusting variables that affected production rate and production efficiency (voltage, type of current, plate distance, number of plates, and/or electrolytes in the water).

Results

Results that helped find the optimum production rate:
  - The closer the plates are together, the higher the rate and efficiency.
  - More plates produced more gas in a better-than-linear fashion.
  - DC current is better than AC current rate-wise.
  - Increasing power increases rate but decreases efficiency above 1.48 volts.
  - Electrolytes: Table salt (NaCl) decreases production rate but adding sodium-carbonate (Na_2CO_3))increases rate and efficiency because it encourages the electro-chemistry without participating in it.

By applying all the optimization results I showed that I could produce enough hydrogen real-time (goal was 714 mL/min) to run a car with a reasonable number of batteries and plates.

Conclusions/Discussion

My results supported my hypothesis and indicate that hydrogen is potentially a good alternative to gasoline for running cars as it is more efficient as a fuel, can be produced rapidly enough from water (using electricity from batteries) to not require storage, and is clean for the environment.

Summary Statement

This project optimized the splitting of water for use as a fuel to run cars.

Help Received