



**CALIFORNIA STATE SCIENCE FAIR  
2008 PROJECT SUMMARY**

<b>Name(s)</b> <b>Nishitha Viswanathan</b>	<b>Project Number</b> <b>J0835</b>
<b>Project Title</b> <b>The Fuss over Fuel Cells</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Hydrogen fuel cells are electrochemical energy conversion devices. This means that they convert chemical energy into electrical energy. This process is able to occur only when the two fuel sources, hydrogen and oxygen, are continuously supplied. One of the factors which determines the hydrogen and oxygen production includes the type of electrolyte used. The focus of this experiment is conceptually demonstrate the hydrogen fuel cell due to the fact that hydrogen is highly flammable and difficult to obtain. Hypothesis: If you use an electrolyte with a low conductivity value, then the conversion efficiency (electrical power) of the fuel cell will decrease.</p> <p><b>Methods/Materials</b> Electrodes-platinum coated nickel wires (30 cm),cup,digital multimeter,circuit board,toggle switch,4 electrolytes: tap water,coke,lemon juice,white vinegar,and a 9 Volt battery In my experiment, I connected a circuit board and a single pole, double throw (SPDT) toggle switch. To this device, I also connected 2 insulated, copper wires and a 9 V battery. The cup is used to hold the various electrolytes and dipped in the electrolyte, are the electrodes which have been coiled and connected to the circuit board and multimeter. I used the process of electrolysis (passing an electric current through an electrolyte) to generate the fuel sources of hydrogen and oxygen. I then flipped the toggle switch to recombine these two fuel sources to produce electricity. I repeated this procedure for each electrolyte.</p> <p><b>Results</b> Out of the 4 electrolytes, vinegar and lemon juice produced more fuel sources, therefore more electricity. The coke started out by producing a tremendous amount of hydrogen and oxygen although the decline was incredibly quick. This could have been because of the continuous ionization in the phosphoric acid. In the case of the tap water, the depletion of the hydrogen and oxygen were quite similar. This disproved my theory because I believed that the high citric acid content in the lemon juice would cause it to produce more of the fuel sources/electricity. Although, it is a possibility that a residue of tap water got mixed in with the lemon juice due to the fact I used the lemon juice corresponding to the tap water.</p> <p><b>Conclusions/Discussion</b> The power generated by the fuel cell does not correlate to the conductivity of the electrolyte. This necessitates further experimentation and development to figure out the reasons behind this conclusion.</p>	
<b>Summary Statement</b> My project depicts how the differences in various electrolytes can affect the energy outcomes produced by a hydrogen fuel cell.	
<b>Help Received</b> My dad soldered the wires onto the circuit board and the electrical connectors onto the wood. In addition, he drilled 2 holes into the wooden block and helped me with my board and and interpreting my data. He also supervised me and reinforced what I learned.	