



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Christopher C. Moore	Project Number S0518
Project Title The Effect of Hydrogen Peroxide as the Main Oxidizer in a Polymer Electrolyte Fuel Cell	
Objectives/Goals The goal of the experiment was to develop and test a polymer electrolyte fuel cell, which utilized hydrogen peroxide, as an oxidizer, as well as a traditional oxidizer of diatomic oxygen found in the atmosphere. Both oxidizers were also tested with variations in temperature and pressure for further comparison between the two main operating differences.	
Abstract Methods/Materials The fuel cell was constructed using nafion 115 as the perflourinated proton exchange membrane, pressed between two plates of a platinum/carbon catalyst. The catalyst also functions as an conductor and passage way which allows the passage of hydrogen ions and hydrogen gas. The cell was operated at various temperatures, and pressures. Trials were done using oxygen as the oxidizer as well as hydrogen peroxide, and the pressure and temperatures were also varied. The performances in terms of voltage DC out were compared from the hydrogen peroxide to the oxygen gas.	
Results The data showed that the hydrogen peroxide did produce a greater electric potential in the cell. It created a larger voltage on average than the oxygen gas did. The voltage of the hydrogen peroxide cell increased with temperature and reached 0.32 volts at a high point, and on average reached 0.30 volts. The oxygen powered cell was also dependant on its surrounding temperature, however its max average voltage reached only 0.28 volts. The hydrogen peroxide cell was drastically affected by the change in hydrogen gas pressure, while the oxygen powered cell remained at a constant voltage output.	
Conclusions/Discussion The percent deviations for the trials involving the change in temperature and pressure remained on average below 5 percent. It would seem that the hydrogen peroxide was able to produce a larger voltage because of the stronger ionization energy, and the therefore greater affinity of hydrogen ions. It is also important to notice that the hydrogen peroxide creates water, which is necessary to keep the cell hydrated at all times. The hydrogen peroxide, when ionized in solution, becomes water which helps reduce the impact of osmotic drag on dehydrating the anode. The hydrogen peroxide liquid, while not greatly improving the performance, does offer a viable alternative to more dangerous and expensive oxidizers such as fluoride or liquid oxygen	
Summary Statement A study of the effects of hydrogen peroxide as an oxidizer in hydrogen fueled polymer electrolyte fuel cell.	
Help Received none	