



**CALIFORNIA STATE SCIENCE FAIR  
2017 PROJECT SUMMARY**

<b>Name(s)</b> <b>Jason B. Morris</b>	<b>Project Number</b> <b>S0624</b>
<b>Project Title</b> <b>The Effect of Electrolyte Solution and Concentration on the Production of Oxy-Hydrogen</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The purpose of this experiment is to determine which type and amount of electrolyte solution will produce the most oxyhydrogen in an electrochemical cell. Creating the gas will be done by electrolyzing water with an added electrolyte.</p> <p><b>Methods/Materials</b> A oxyhydrogen electrochemical cell was constructed using various plumbing fittings, plexiglass and plastic tubing. 14 gauge stainless steel was cut to use as the electrodes and cathodes. The plates were sanded to increase surface area which in turn produces more oxyhydrogen. 1,532g of distilled water was used in the electrolyte solution because it contains very little impurities. Three different electrolytes were tested (sodium hydroxide, potassium carbonate, potassium hydroxide) at four different concentrations (5%, 10%, 15%, 20% by weight). The cell was powered with a 12 volt dc power supply. Production of gas was measured by timing how long it took to displace water in a one liter bottle.</p> <p><b>Results</b> 15% Potassium Hydroxide is the best effective electrolyte at producing oxyhydrogen followed by Sodium Hydroxide and then Potassium Carbonate. Potassium hydroxide produced 62 ml/min of oxyhydrogen, 5 ml/min more than sodium hydroxide and 8 ml/min more than Potassium hydroxide. Strong electrolytes completely ionize in water. A strong electrolyte is either a strong acid or strong bases. Potassium Hydroxide and Sodium Hydroxide is a very strong base with a ph of 12. Potassium carbonate has a ph of 11. Once the concentration of the electrolyte by weight reached 20% the production of oxyhydrogen decreased to a lower production rate than the concentration of the 15% electrolyte solution.</p> <p><b>Conclusions/Discussion</b> Oxyhydrogen is used in various applications such as oxy-gas torches as it burns at very high temperatures. Oxy gas torches are used for cutting and welding various materials including metal. Capturing the gases separately that are produced on the anode and cathode would results in very pure oxygen and hydrogen. Oxygen has applications in the medical field as well as recreational activities (scuba diving). It is also used in life support systems. In the industrial environment, oxygen is mostly used to refine iron ore into steel. Hydrogen can used to fuel hydrogen cars.</p>	
<b>Summary Statement</b> Maximizing the generation of Oxy-hydrogen by determining the best electrolyte to use	
<b>Help Received</b> Craig Morris, my dad, helped with the cutting of the stainless steel plates	