



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Uzair Sajid	Project Number J0626
Project Title The Emergence of a New Fuel Cell	
<p style="text-align: center;">Abstract</p> <p>Objectives The purpose of this project is to see how water can be used as a renewable energy source by testing how efficient a cobalt-based catalyst will be in producing molecular oxygen from water splitting reaction.</p> <p>Methods This was done by creating a galvanostatic chemical cell using 9-volt batteries and breadboard. A constant current of 3mAmps was passed through the nickel electrodes through the phosphate buffer solution to run it at a constant rate. After the voltage was stabilized, the catalyst was formed on the anode side of the plates, and the procedure was repeated with fresh phosphate buffer solution.</p> <p>Results The efficiency of the created galvanostatic electrochemical cell was observed by the voltage measured across while keeping the constant current of 3mAmps. The average stabilized voltage reading after the three trials was 2.09 volts for the pure phosphate buffer solution. The voltage was lessened to 1.85 volts after the cobalt based catalyst formed on the electrode plate was placed in the fresh phosphate buffer solution. This shows a difference of 240 millivolts, which shows the extra savings of energy we are getting by splitting water into Hydrogen and Oxygen. These voltage difference was used to determine the efficiency rate of water splitting with growing the cobalt based catalyst. The growing of catalyst took about 20 minutes to give a stabilized voltage reading. The efficiency of the reaction was 59% before growing the catalyst. After adding the catalyst, the water efficiency was increased to 66%. This 6% increase in efficiency proves how we can use a cobalt based catalyst to obtain the tough task of separating the Oxygen molecules from water with lesser voltage at a constant rate.</p> <p>Conclusions What was found that adding the catalyst indeed lowered the voltage needed to split water molecules into Hydrogen and Oxygen? Hence, this made the reaction more efficient and required less energy. Once the hydrogen and oxygen combust, they will produce water and the cycle can be repeated. This addition of new fuel cell will give us a healthier environment without emission of pollutants and more options to use solar panels at night.</p>	
Summary Statement The invention of a new fuel cell by using a cobalt based catalyst to split water efficiently.	
Help Received My mom and dad supervised me while I connected the circuits on the breadboard.	