CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

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Project Number

J0607

Project Title

Testing Different Methods of Water Electrolysis: Lead Pencil Electrodes vs. Metal Thumbtack Electrodes

Abstract

Objectives

My goal is to determine the most effective method of water electrolysis. In particular, to determine the most effective method I measured which produced the most amount of gas. My hypothesis is the thumbtack method will produce more gas because metal has a higher conductive property than carbon due to the molecular structure.

Methods

Both methods have constants of water, salt, electric tape and, a 9-volt battery. Salt is an electrolyte which will make the water conductible. Both procedures for the electrolysis process are similar except on a molecular level. In addition, for electrolysis, both method designs are different, as well as when I tested with test tubes. The positions of the electrodes had to changed for each design. The thumbtack electrodes are on the side while the pencils are on top held by cardboard. I measured three types of data. First, with test tubes to collect and measure the gas produced, a voltage meter to record the voltage and pH paper to indicate the pH levels.

Results

My results were not surprising considering how metal electrodes have more conductivity than carbon. My test results are the following. The voltage for the thumbtack method was 8.37 volts while the pencil method was 3.28 volts. The pH levels were 8 pH for the Thumbtack method and 7 pH for the pencil method. The pencil method did not give off oxygen, however did make chlorine, because of a special byproduct reaction. The thumbtack method gave off 3 inches of hydrogen and 1 inch of oxygen. The pencil method gave off 3 inches of hydrogen and 3 inches of chlorine.

Conclusions

My results supported my hypothesis that the thumbtack method will produce more gas because metal has a higher conductive property and this could change the world because they can design cars to be water electrolysis powered which would work more efficiently with metal electrodes. If further testing was conducted nickel, as well as Zinc, might work well because they are cheaper and are not able to corrode. Metal electrodes are also used for water dialysis which makes seawater into freshwater and, also can make hydrogen fuel.

Summary Statement

My experiment is fundamentally about the comparison of two water electrolysis methods

Help Received

Some assistance was from Navneet Brar (MOM) with the completion of the board and Gurinder Chatha (DAD) with the cutting of speaker wire.