CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
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Project Number
J0606

Project Title
Hydrogen: The Quest for Renewable Energy

Abstract

Objectives/Goals
DETERMINE THE MOST EFFICIENT METAL TO PRODUCE HYDROGEN THROUGH ELECTROLYSIS

Methods/Materials
I FILLED THE TUB WITH THREE GALLONS OF WATER. I FILLED COLLECTION CONTAINERS WITH WATER UNTIL NO AIR WAS LEFT. I PLACED THE ELECTRODES AND RAISED THE CONTAINER AND THE ELECTRODE UPRIGHT WITHOUT LETTING ANY AIR IN. I CONNECTED THE STRIPS TO THE POWER OUTLET. THE 6V BATTERIES DID NOT PRODUCE ENOUGH POWER, SO I SWITCHED TO A HOME WALL OUTLET. THIS CURRENT IS ALTERNATING CURRENT, NOT DIRECT CURRENT FOUND IN BATTERIES. I READ THE AMOUNT OF GAS CAPTURED IN THE COLLECTION CONTAINERS EVERY SIXTY MINUTES, FOR FOUR HOURS. I CHANGED THE WATER AND REMOVED ALL RESIDUE ON THE METALS WITH SODA AFTER EACH EXPERIMENT. I RECORDED THE DATA, AVERAGED AMOUNTS COLLECTED AND FOUND THE PRODUCTION RATE. I CREATED GRAPHS TO COMPARE THE DATA AND FOUND WHICH METAL WAS MOST EFFICIENT.

4 EACH NICKEL, STAINLESS STEEL, MAGNESIUM STRIPS, 4 COLLECTION CUPS, 4 6V BATTERIES , 1 EACH: PLASTIC TUB , 1V POWER SOURCE, BAG OF MINI CLIPS, BREADBOARD, MULTI-METER, PACKAGE OF 22-GAUGE HOOKUP WIRE, 10K OHM CARBON-FILM RESISTERS, SAFETY GOGGLES, TIMER , FIRE EXTINGUISHER.

Results
ALL METALS PRODUCED HYDROGEN AND OXYGEN. STAINLESS STEEL PRODUCE 2.042 ML ON AVERAGE OVER 4 HOURS. NICKEL PRODUCED 6.417 ML ON AVERAGE. MAGNESIUM PRODUCED THE MOST WITH 36.667 ML ON AVERAGE. MAGNESIUM PRODUCED ABOUT 20 TIMES MORE GAS THAN NICKEL AND 67 TIMES MORE THAN STAINLESS STEEL. THE AVERAGE RATE OF PRODUCTION WAS 0.56 ML/HR FOR STAINLESS STEEL, 1.58 ML/HR FOR NICKEL AND 117.5 ML/HR ON AVERAGE FOR MAGNESIUM. AFTER THE EXPERIMENTS I OBSERVED THAT ALL THE ELECTRODES CORRODED. MAGNESIUM SHOWED THE MOST WEAR AS IT BECAME SMALLER AND FIT MORE LOOSELY IN THE STAND. I OBSERVED THE PRODUCTION RATE PEAKED AND THEN DECLINED.

Summary Statement
To determine the most efficient metal for an electorde used to produce hydrogen through electrolysis,

Help Received
Parents Supervised Experiment, Proof reading by parents