CALIFORNIA STATE SCIENCE FAIR
2002 PROJECT SUMMARY

Name(s)

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Project Number

22394

Project Title

Hydrogen: A Future Fuel Source? At Home Solar Panel Efficiency in Electrolyte Hydrogen Production for Fuel Cell Autos

Abstract

Objectives/Goals

The objective was to determine if the electrolyte hydrogen production through the use of solar panels was an affective and affordable way to produce energy at home for the hydrogen fuel cell powered automobile.

Methods/Materials

A 13"x14" solar panel and a 4"x12" solar panel were tested 10 times simultaneously by using two Hoffman Electrolysis Apparatus to find out how much hydrogen was produced by each panel in 30 minutes. Because the 13"x14" solar panel is 2.8 (280%) times larger than the 4"x12" solar panel, we compared the results of the 10 trials to determine if the comparative hydrogen production outcome of the two panels was within the vicinity of 280%. Mathematical calculations were then used to determine the number of solar panels needed in approximately a 24-hour period to produce 31.1 gallons of hydrogen at 3,000 psi for use in the fuel cell hydrogen powered automobile.

$$v2 = \frac{(3{,}000 \text{ psi})\ (31.1 \text{ gal})}{14.7 \text{ atmospheric pressure}} = 6{,}347 \text{ gal} = 23{,}951 \text{ Liters}$$

Results

The 13"x14" solar panel produced .042 liters of hydrogen per 30 minutes, whereas the 4"x12" solar panel produced .016 liters. The results indicate that the larger solar panel produced 268% more hydrogen than the smaller panel in 30 minutes. Due to these results being 96% accurate to our 280% goal, we used this data for mathematical calculations. Using the average of .042 liters of hydrogen per 30 minutes, we multiplied these results by 10,000 and found that at 420 liters per 30 minutes it would take 395 solar panels of 4'x8' size a little over a day to produce 31.1 gallons of hydrogen at 3,000 psi.

$$\frac{420 \text{ Liters}}{.5 \text{ hour}} = \frac{23{,}951 \text{ Liters}}{X \text{ hours}} = 28.5 \text{ hours} = 1.18 \text{ days}$$

A 1300"x1400" Solar Panel = 1,820,000 sq. in. = 12,639 sq. ft. = 395@4'x8'

Conclusions/Discussion

Through the use of solar panels, hydrogen can affectively be produced at home through electrolysis. Is it affordable? No. At home the general public cannot afford to purchace, install, and maintain 395 solar panels of 4'x8' size.

Summary Statement

Hydrogen was produced by connecting 13"x14" and 4"x12" solar panels to two Hoffman Electrolysis Apparatus to determine if this is a affective and affordable way to produce energy at home for the hydrogen fuel cell powered automobile.

Help Received

Paul Evert RV Comapny loaned us 2 solar panels; Mother helped by driving, editing, and typing; Science Teacher helped in mathematical calculations, asking questions, and creating solar panel testing board.

Preliminary