Development of a Novel Solution Using a Multi Catalyst Process to Lower the Activation Energy to Produce Clean Hydrogen

Smith, Davonna (School: Herriman High School)

With renewed interest in green fuel technology as an alternative to fossil fuels, interest has returned to hydrogen production and improving the electrolysis process. The key issue is how to lower the amount of energy to convert Water (H_2O) into Hydrogen (H_2) and Oxygen (O_2). Leveraging research by the M.I.T. professor Dr. Daniel G. Nocera, showed plating Nickel with a Cobalt–Phosphate catalyst could lower the amount of voltage to break covalent bonds of water. The new catalyst used earth-abundant materials of Nickel, Cobalt, and Phosphorus, instead of relying on rare precious metals like Platinum. Additional research at Rice University showed using UV light as a catalyst also reduced power consumption by adding energy into the system through the photoelectric effect. Lastly, research by Dr. Ali Saad showed that ultrasonic vibration would increase the gas production by helping to remove the gas formed on the Anode and Cathode surfaces. My research incorporates these findings to investigate if power consumption could be further reduced if Stainless-Steel was used in place of Nickel. In addition to solid plates, wire mesh would be used in an effort to increase the surface area in contact with the water. The experiment would hold the supplied wattage constant, and the number of 100 cm^2 test plates would be scaled to see the effects on gas production. As Dr. Daniel G. Nocera states, if solar power were to convert water into H_2 and O_2, it would be like a plant converting sunlight and water into breathable Oxygen.

Awards Won: