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The Solar Thermal Decoupled Electrolysis of Water Process: An Investigation of the Electrochemistry in a Base

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The solar research team at Valparaiso University is developing solar thermal chemical processes that will transform solar energy into economically viable and reusable energy forms. One subgroup is working on the Solar Thermal Decoupled Electrolysis of Water Process. In this multi-step process, the electrolysis of water to generate hydrogen occurs at room temperature outside of the solar reactor, and it is facilitated by the oxidation of magnetite (Fe3O4) to hematite (Fe2O3). The hematite is then pumped to the solar reactor where it is reduced back to magnetite at high temperatures with the liberation of oxygen. This cycle is then repeated. The electrolysis in the presence of magnetite has been previously demonstrated in an acidic solution. To complement the acid studies, the electrolysis was performed in a basic solution using an H-cell and a potentiostat. The effects of the oxidation of magnetite in a basic solution on the electrolysis of water were analyzed. It was found that the addition of magnetite lowers the required voltage needed for electrolysis. It is important to lower the voltage for the electrolysis so that the amount of electrical input required for the entire process is minimized.

Information about the Author:
Jessica Guertin is a senior biochemistry major from Milford, MI. She began her work with Dr. Palumbo in the summer of 2011 as a chemistry consultant and collaborator on this engineering project. She is especially interested in environmentally conscious science, the development of clean energy, and the disposal of environmentally harmful compounds. She will be entering the workforce in June of this year and transitioning to medical school in 2013.

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