2011

Decoupled Solar Thermal Chemical Electrolysis of Water to Produce Hydrogen

Melissa Meyer

Megan Wilken

Decoupled Solar Thermal Chemical Electrolysis of Water to Produce Hydrogen

Authors: Melissa Meyer, Megan Wilken

Affiliation: Mechanical Engineering

Solar thermal chemical research at Valparaiso University focuses on using concentrated solar energy to produce hydrogen, which can be used to generate electricity in fuel cells. A two-step solar electrolytic process has been proposed for chemical systems such as Fe2O3/Fe3O4, Co3O4/CoO, and Mn2O3/MnO. This new process produces hydrogen using ideally 63-82% less electricity than the traditional electrolytic process. Theoretical solar-to-electrical efficiencies are approximately 19-40%, a range comparable to similar solar thermal chemical processes. Preliminary experimental work with the Fe2O3/Fe3O4 system has validated the chemical possibility of each step of the process. Future work seeks to determine if the proposed processes are all chemically possible, optimize their operation on a small scale and explore their viability on an industrial scale.

Information about the Authors:

Faculty Sponsor: Robert Palumbo

Student Contact: melissa.meyer@valpo.edu