

**Valparaiso University**  
**ValpoScholar**

---

Symposium on Undergraduate Research and  
Creative Expression (SOURCE)

Office of Sponsored and Undergraduate Research

---

2011

# Decoupled Solar Thermal Chemical Electrolysis of Water to Produce Hydrogen

Melissa Meyer

Megan Wilken

Follow this and additional works at: <https://scholar.valpo.edu/cus>

 Part of the [Mechanical Engineering Commons](#)

---

## Recommended Citation

Meyer, Melissa and Wilken, Megan, "Decoupled Solar Thermal Chemical Electrolysis of Water to Produce Hydrogen" (2011).  
*Symposium on Undergraduate Research and Creative Expression (SOURCE)*. 95.  
<https://scholar.valpo.edu/cus/95>

This Poster Presentation is brought to you for free and open access by the Office of Sponsored and Undergraduate Research at ValpoScholar. It has been accepted for inclusion in Symposium on Undergraduate Research and Creative Expression (SOURCE) by an authorized administrator of ValpoScholar. For more information, please contact a ValpoScholar staff member at [scholar@valpo.edu](mailto:scholar@valpo.edu).

## **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  $\text{Fe}_2\text{O}_3/\text{Fe}_3\text{O}_4$ ,  $\text{Co}_3\text{O}_4/\text{CoO}$ , and  $\text{Mn}_2\text{O}_3/\text{MnO}$ . 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  $\text{Fe}_2\text{O}_3/\text{Fe}_3\text{O}_4$  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