

Solar Production of H₂ by Zn Nanoparticles Hydrolysis

Prof. Jane Davidson (PI), Tareq Abu Hamed, Julia Haltiwanger,
Aiman Alshare & Luke Venstrom

Mechanical Engineering, University of Minnesota

NNIN Facility utilized: Characterization Facility

● OBJECTIVES OF WORK

- ◆ Production of hydrogen via a 2-step solar Zn/ZnO water splitting process in which water is the feed stock and concentrated sunlight is the energy source (Fig. 1).
- ◆ To achieve high H₂ conversion in step 2 (Fig. 1) and to recover ZnO for reprocessing in step (1) via simultaneous synthesis and hydrolysis of Zn nanoparticles

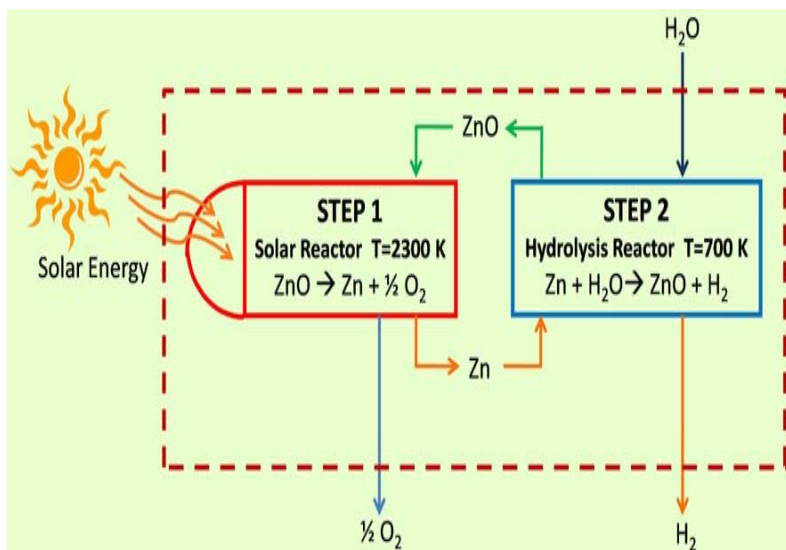


Fig. 1. A two-step water splitting thermochemical cycle to produce H₂.

● MAJOR OBSERVATIONS

- ◆ Hydrogen Conversions up to 96%
- ◆ 33-55 nm ZnO nanoparticles

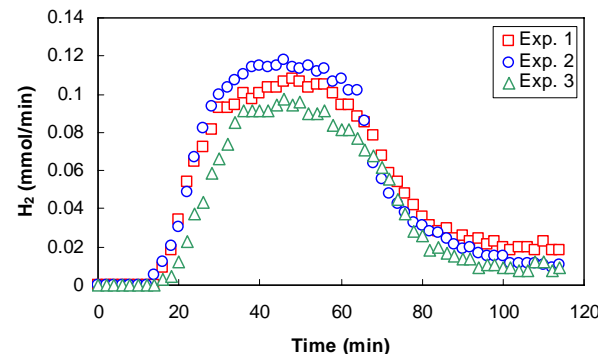


Fig. 2. H₂ production rate.

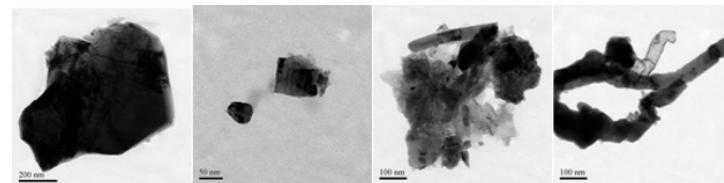


Fig. 3. TEM pictures produced ZnO nanoparticles.

● Publications

- ◆ Abu Hamed, T., Davidson, J.H., Stolzenburg, M., 2007, "Hydrogen Production via Hydrolysis of Zn in A Hot Wall Flow Reactor," Proceedings of the ASME Energy Sustainability Conference, Paper No. 36176, Long Beach, CA, June 27-30. To appear in the Journal of Solar Energy Engineering.
- ◆ Abu Hamed, T., Davidson, J.H., Haltiwanger, J.F., 2007, "Hydrogen Production via Hydrolysis of Zinc Nanoparticles" Proceedings of the AIChE Annual Meeting, Salt Lake City, Utah, November 4 -9.