

# Solar Thermal Energy at Arizona State University

Robert Taylor<sup>\*</sup>, Todd Otanicar, Mark Witt, John Sherbeck, Patrick Phelan

*Arizona State University, Tempe, AZ 85287*

The largest source of renewable energy in the world comes in the form of solar energy with an average amount of power incident on the earth's surface of 178,000 terra Watts. One method for harvesting the power of the sun is solar thermal energy conversion. Solar thermal energy can be used in various manners but typical applications are: hot water production, electricity generation, and hydrogen production. The use of nanotechnology provides enormous promise to transform almost every aspect of human industrial activity. This potential can be used to harvest solar thermal energy in new and/or more efficient ways. We have been investigating different approaches that utilize nanotechnology in the form of nanofluids, liquid-nanoparticle suspensions, for use in solar thermal energy applications. One method that has been proposed is to directly absorb the solar energy within the fluid volume. Using a micro-solar thermal collector developed for the production of hydrogen the use of nanofluids as the working fluid, as well as the absorber, this has been investigated. Investigations were made into the impact of particle size, particle shape and volume fraction on the efficiency of the solar collector as well as the stagnation temperature. Also being investigated is the interaction of a nanofluid under concentrated solar irradiation are being studied, with very interesting results. In addition to the nanofluid research, the research group has been investigating the coupling of solar thermal energy and cooling, using absorption and adsorption chiller systems. One such system, using an absorption chiller system built for gas power, is being retrofitted to use solar thermal energy as the heat source. The system is currently being constructed on the roof of the Engineering Research Center.

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<sup>\*</sup> E-mail: rataylo2@asu.edu