

**Institute of Energy Technology – Professorship of Renewable Energy Carriers*****Invitation to a Seminar***

- Date:** Monday July 12, 2010  
**Time:** 16:00-17:00  
**Place:** Maschinenlaboratorium ETH Zürich, ML-J25/26  
**Speaker:** Dr. Andrea Ambrosini, Sandia National Laboratories,  
Albuquerque, New Mexico USA  
**Title:** Sunshine to Petrol: Thermochemical CO<sub>2</sub> splitting using concentrated solar energy and related materials issues

The Sunshine to Petrol (S2P) effort at Sandia National Laboratories aims to convert carbon dioxide and water to precursors for liquid hydrocarbon fuels using concentrated solar power. At the heart of the S2P effort is the Counter-Rotating-Ring Receiver Reactor Recuperator (CR5), a heat engine designed to facilitate the splitting of CO<sub>2</sub> and H<sub>2</sub>O using metal oxides as the reactive material. Significant advances have been made in the field of solar thermochemical CO<sub>2</sub>-splitting technologies utilizing metal oxide systems such as A<sub>x</sub>Fe<sub>3-x</sub>O<sub>4</sub> (A = Fe, Co, Ni). Such materials work via basic redox reactions, for example:



It previously has been shown that the ferrite materials are not effectively reactive on their own and require a support of some sort, such as yttria-stabilized zirconia (YSZ). However, the ferrite-support interaction (solid solubility, microstructure, reaction kinetics) is not well defined, as there has been little fundamental characterization of these metal oxides at the high temperatures and conditions present in these cycles. A systematic study of these materials is underway in an effort to begin to elucidate microstructure, structure-property relationships, and the role of the support on redox behavior under high-temperature reducing and oxidizing environments. This includes simulating CO<sub>2</sub>-splitting reactions in the lab using temperature-programmed reduction and oxidation, thermogravimetric analysis (TGA), x-ray diffraction (XRD), and scanning electron microscopy (SEM). This seminar will cover a brief overview of the S2P project at Sandia, followed by a discussion of the materials efforts in the ferrite-YSZ system.

**Dr. Andrea Ambrosini** is a member of the technical staff at Sandia National Laboratories in Albuquerque, New Mexico USA.