ASU LightWorks
ARIZONA STATE UNIVERSITY

LightWorks® Lecture Series

Professor Aldo Steinfeld

Department of Mechanical and Process Engineering of ETH Zurich

Jet Fuel from H_2O, CO_2 and Solar Energy

The entire production chain for renewable kerosene obtained directly from sunlight, H_2O, and CO_2 has been experimentally demonstrated. The key component of the production process is a high-temperature solar reactor containing a reticulated porous ceramic (RPC) structure made of ceria, which enables the splitting of H_2O and CO_2 via a 2-step thermochemical redox cycle. In the 1st reduction step, ceria is endo-thermally reduced using concentrated solar radiation as the energy source of process heat. In the 2nd oxidation step, nonstoichiometric ceria reacts with H_2O and CO_2 to form H_2 and CO – syngas – which is finally converted into kerosene by the Fischer-Tropsch process. The RPC featured dual-scale porosity for enhanced heat and mass transfer: mmsize pores for volumetric radiation absorption during the reduction step and μm-size pores within its struts for fast kinetics during the oxidation step. We report on the engineering design of the 4 kW solar reactor and the experimental demonstration of over 290 consecutive redox cycles for producing high-quality syngas suitable for the processing of liquid hydrocarbon fuels.

Reference: Marxer D., Furler P., Scheffe J., Geerlings H., Falter C., Batteiger V., Sizmann A., Steinfeld A., "Demonstration of the entire production chain to renewable kerosene via solar thermochemical splitting of H2O and CO2", Energy & Fuels 29, pp. 3241-3250, 2015.

Thursday, July 7, 2016
11:00 am – 12:00 Noon
Wrigley Hall 481 (ASU Tempe)
Light refreshments will be provided

Host: Ellen B Stechel
Deputy Director, LightWorks®
Ellen.Stechel@asu.edu

www.asulightworks.com

RSVP: sustainability.asu.edu/events