

## SEMINAR SERIES

# HIGHLIGHTS IN ENERGY RESEARCH

07. 06. 2018, 10:30 - 11:30, ENERGYPOLIS Sion, 4<sup>th</sup> floor, ZEUZIER room

## Solar Energy to Fuels, Chemicals and Electricity

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In the long run, it is likely that all the basic human needs will be met by renewable sources like solar energy. However, there are several challenges associated with the harness, storage and use of solar energy to meet our daily needs for food, chemicals, heat, electricity and transportation. The research in our group is focused on addressing some of these challenges and we will present our results in a two-part presentation.

In the first part of the presentation, we will discuss results from our energy systems modeling for liquid fuel production. An exciting aspect of producing fuels and chemicals from biomass is learning to produce the array of molecules that we need with minimum process transformation steps and energy use while maximizing biomass carbon recovery. In this respect, recent advancements at Purdue by a team of chemists, biologists and chemical engineers will be presented. We will show the new pathways and the associated catalysts that have been developed for the production of fuel and chemicals from biomass.

In the second part of the presentation, we will discuss our research related to solution-processed thin-film inorganic solar cells. We will present process and technical solutions leading to power conversion efficiencies that are among the highest for  $\text{Cu}(\text{In,Ga})\text{Se}_2$  and  $\text{Cu}_2\text{ZnSnSe}_4$  based solar cells by solution based routes. We will also discuss the exciting new chemistry using amine/thiol mixtures for molecular precursor inks and fabrication of solar cells from them. The excitement of solution route's science and technology along with its challenges will be presented.



**Prof. Rakesh Agrawal** is the Winthrop E. Stone Distinguished Professor in the Davidson School of Chemical Engineering at Purdue University. He received a B. Tech. from the Indian Institute of Technology, Kanpur, an M.Ch.E. from the University of Delaware and an Sc.D. in chemical engineering from MIT.

His research includes novel processes for the fabrication of low-cost thin-film solar cells, energy systems analysis, biomass to liquid fuel conversion, synthesis of efficient multicomponent separation processes using distillation, membranes and adsorption, and basic and applied research in gas separations and liquefaction. Agrawal has published 186 technical papers and has given over 230 invited lectures. He holds 125 U.S. and more than 500 foreign patents. These patents are used in over one hundred chemical plants with total capital expenditure in multibillion dollars. He has served on technology and engineering advisory boards of a number of companies.

He is a member of the U.S. National Academy of Engineering, a Fellow of the American Academy of Arts and Sciences, a Fellow of the US National Academy of Inventors and a Fellow of the Indian National Academy of Engineering. Agrawal received the National Medal of Technology and Innovation from President Obama in 2011.