PURDUE UNIVERSITY Discovery Park

Birck Nanotechnology Center
Discovery Park Engagement
Energy Center

SOLAR SEMINAR SERIES

SPRING 2013 PHOTOVOLTAIC SEMINAR SERIES

RAKESH AGRAWAL

Birck Rm. 2001
January 10, Thurs., 3:30 p.m.

Rakesh Agrawal is the Winthrop E. Stone Distinguished Professor in the School of Chemical Engineering at Purdue. He received the National Medal of Technology and Innovation Award in 2010, the highest honor for techno-logical achievement given by the President of the United States to America's leading innovators.

A major thrust of his research is related to energy issues and includes novel processes for fabrication of low-cost solar cells, biomass and liquid fuel conversion, and energy systems analysis. His research further includes synthesis of multi-component separation configurations including distillation, membrane and adsorption based processes, basic and applied research in gas separations, process development, gas liquefaction processes and cryogenics.

Thin Film Solar Cells from Nanocrystal Inks of Quaternary Chalcogenides

The creation of a suitable inorganic colloidal nanocrystal ink for use in a scalable coating process is a key step in the development of low-cost thin film solar cells. We have developed an innovative method of using copper indium gallium disulfide (CIGS) nanocrystals as the building block for the fabrication of bulk CIGSSe thin films. The CIGS nanocrystal ink solution is applied directly on various substrates to form a thin film coating. The CIGS nanocrystals are then consolidated into large crystalline chalcopyrite domains by a brief thermal treatment under Se vapor. Furthermore, the ability to control the composition for CIGS nanocrystals allows the unique capability to bandgap engineer the CIGSSe absorber using nanocrystals with different ratios of In/Ga. By optimizing processing conditions for the various layers in the solar cells, total area efficiency of 14.2% under AM1.5 illumination has been achieved.

Our scouting experiments based on the adaptation of CIGS method has also resulted in Cu_2ZnSnS_4 (CZTS) nanocrystals and the associated PV devices. Although the solar cell performance of the currently fabricated solar cells is somewhat low (total area power conversion efficiencies in the range of 8.4% to 9.4%), the results are very promising and investigation is underway to improve their chemical and structural properties.

Refreshments & Networking Opportunities

PURDUE UNIVERSITY

Seminar Series Dates: Jan. 10, 24; Feb. 7, 21; March 7, 21; April 4, 18

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