

# ECE Speaker Series

Department of Electrical  
and Computer Engineering

## Syed Mubeen

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University of Iowa

### Engineering Nanomaterials for Solar Fuel and Chemical Production

Environmental considerations require the world, to increase, ever more urgently, the renewables fraction of its energy usage. The focus on solar energy will certainly rise, and will include both photovoltaics and the much less well developed goal of using sunlight to convert available feedstocks such as water, CO<sub>2</sub> and domestic and industrial waste directly to valuable chemicals and fuels. This talk will introduce our research efforts to develop novel nanomaterials and architectures to convert light energy directly into high free energy materials that can be used as fuels and fine chemicals, thereby storing the solar energy in a high energy density and transportable form. The first part of the talk will focus on our efforts to develop a novel molecular level design and synthesis strategy for successfully stabilizing efficient semiconductor photovoltaic junctions for solar fuel production. The second part of the talk will focus on exploring device strategies towards utilizing a wholly different range of materials, namely plasmonic metals, as solar converters. Here we report use of hot electrons from plasmonically active metals to drive important fuel and chemical producing reactions such as water splitting and CO<sub>2</sub> reduction reaction. The devices built using plasmonic metals demonstrated very stable operation under photoelectrochemical environment of the cell allowing us to strike a compromise between efficiency and durability for converting sunlight to usable chemicals.

**November 21, 2016 at 10:00am in Egr Bldg 2, Rm W122**

*Syed Mubeen is currently an Assistant Professor in Chemical and Biochemical Engineering at The University of Iowa. His research interests center on developing cost-effective materials and systems for electrochemical energy conversion and storage, understanding electrochemical reaction pathways in supercritical environments, and to understand surface plasmon mediated energy generation and transport pathways for photoelectrochemical applications. Mubeen received his B.Tech in Chemical and Electrochemical Engineering at Central Electrochemical Research Institute, India. He received his Ph.D. in Chemical and Environmental Engineering with Prof. Nosang Myung and Prof. Marc Deshusses at UC Riverside. As a Postdoctoral Scholar at UC Santa Barbara, he studied plasmonic metals and semiconductors for photoelectrochemistry working with Prof. Martin Moskovits, Prof. Galen Stucky and Prof. Eric McFarland. He is also associated with two start-up companies, as lead scientist for HyperSolar Inc and co-founder of PANI CLEAN Inc.*



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