

**Towards Cost Competitive Electrochemical Energy Conversion
and Storage Systems**

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Faculty host: Mark Mba-Wright

Seminar on November 13, 2018 at 11:00 am in 2004 Black

Abstract

Becoming more energy sustainable is a major current societal goal, which, of necessity, involves greater use of sunlight as a primary source of energy. However, if solar energy is ever to displace fossil fuels as our main energy source, it could only do so if we solve the energy storage problem. This talk will first introduce how cost drives materials and systems research for solar fuel production. The second portion of the talk will discuss our research efforts to develop novel materials and systems to convert light energy directly into high free energy materials that can be used as fuels and chemicals, thereby storing the solar energy in a high energy density and transportable form. The photoelectrochemical systems were developed utilizing several potential concepts including: (i) semiconductor and/or Schottky junction-based nanostructures employing earth abundant elements (e.g. SnS photocathodes; BiVO₄/WO₃ photoanodes); (ii) low-cost electrochemically manufactured multi-junction cell (e.g. CdTe based multijunction cells) and (iii) oxide encapsulated stable photoelectrochemical nanoreactors. The systems created were able to generate high value oxidation (Cl₂) and reduction (H₂) products sustainably.

Dr. 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. His funding is currently supported by NSF, DOE, and DOI.

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 and did his postdoctoral work at UC Santa Barbara with Prof. Martin Moskovits, Prof. Galen Stucky and Prof. Eric McFarland. He has published over 40 articles (3756 citations) in peer reviewed journals including Nature Nanotechnology, Nano Letters, Energy and environmental Science, ACS Nano, etc. He is also associated with two start-up companies, as lead scientist for HyperSolar Inc and co-founder of PANI CLEAN Inc.

This seminar counts towards the ME 600 seminar requirement for Mechanical Engineering graduate students.