



# Inorganic Chemistry Seminar Series

**Tuesday, April 16, 2019, 12:30 pm**  
**Seaver Science Library, Room 150**

*SSC Auditorium next to the library*

## **Professor Tom Meyer**

*Department of Chemistry*

*University of North Carolina Chapel Hill*

### ***Making Solar Fuels***

In Dye Sensitized Photoelectrosynthesis Cells (DSPEC), separate half reactions for water oxidation to  $O_2$  or reduction to  $H_2$ , or reduction of  $CO_2$  to carbon-based fuels, occur at separate electrodes. Significant progress has been made in the design of both types of electrodes based on nanoparticle film structures. For water oxidation, modification of nanoparticle  $TiO_2$  electrode surfaces by the addition of surface-bound chromophore-catalyst assemblies as surface phosphonates, or with other forms of surface binding, followed by stabilization by Atomic Layer Deposition, has led to stable photoelectrodes for water oxidation. Electrode efficiencies are greatly enhanced by the use of bilayer core-shell structures on the oxide surface that control internal rates of electron transfer. Photoanode structures have been prepared which use high energy visible light to carry out solar water splitting into  $O_2$  with efficiencies that approach 3%. Modified versions of these electrodes have provided a basis for water splitting in integrated DSPEC/Si electrodes and an integrated dye sensitized/DSPEC solar cell for water splitting. The background synthetic chemistry in this area has continued to evolve with the development of a step-by-step synthetic procedure for the preparation of complex surface assemblies including a mimic for PSII. Limited availability of appropriate semiconductors as cathodes for water or  $CO_2$  reduction has hampered development of successful DSPEC photocathodes. But recent promising advances include developing electrodes with external film-based catalysts and using nanowire Si catalyst surfaces as photocatalyst surfaces for water reduction.

Hosted by Professor Smaranda Marinescu

*The scientific community is invited*

**USC Department of Chemistry**

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