UNIVERSITY OF RHODE ISLAND
Department of Chemistry

GRADUATE STUDENT HOSTED SEMINAR

Room 234 Pastore Hall
3:00 p.m, Monday, Sept. 28, 2015

Prof. Gary Brudvig

Benjamin Silliman Professor
and
Chairman
Chemistry Department
Yale University
New Haven, CT

"Water Oxidation for Solar Fuel Production"

HOST

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Water Oxidation for Solar Fuel Production

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Devising cost effective methods for efficiently capturing and storing solar energy is among the grand challenges of science. We are using insights from studies of natural photosynthetic systems to develop bioinspired materials for photo- and electrochemical water oxidation necessary for solar fuel production. Our progress on the development of synthetic water-oxidation catalysts and their use in materials for artificial photosynthesis will be discussed [1]. Molecular catalysts are known for their high activity and tunability, but their solubility and limited stability often restrict their use in practical applications. Recently, we described how a molecular iridium catalyst for water oxidation binds directly and robustly to oxide surfaces without the need for any external stimulus or additional linking groups [2]. On conductive electrode surfaces, this heterogenized molecular catalyst oxidizes water with low overpotential, high turnover frequency, and without detectable degradation. Spectroscopic and electrochemical studies show that it does not decompose into iridium oxide, thus preserving its molecular identity, and that it is capable of sustaining high activity toward water oxidation with stability comparable to state-of-the-art bulk metal oxide catalysts. Current work is aimed at coupling molecular water-oxidation catalysts with high-potential photosensitizers on the surface of a metal oxide photoanode for visible light-induced water oxidation.

References:

[1] K. J. Young *et al., Coord. Chem. Rev.* **2012***, 256*, 2503.
[2] S. W. Sheehan *et al., Nature Comm.* **2015***, 6,* 6469.