CORE-CM SEMINAR
Michigan State University

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Chemical and Materials Science Engineering

Using Physical Organic Chemistry Tools to Solve Problems of Grid-Scale Energy Storage

As global demand for electrical power grows and carbon dioxide levels rise simultaneously, it becomes increasingly necessary to explore possible applications that take advantage of green energy sources, such as solar and wind power. However, a lack of efficient grid-scale energy storage technologies restricts the use of renewable energy sources to times when sun or wind are abundant. Redox-flow batteries (RFBs) offer a potential solution to the unmet challenge of the large-scale integration of intermittent renewable energy sources into the electrical grid. Unlike conventional Li-ion batteries, RFBs utilize solvated charge storage molecules that are pumped over inert electrodes for charging/dischargning and stored in separate reservoirs. This design enables RFBs to be inexpensively scaled by simply adding more of the electroactive com-pounds to the external reservoirs. The deployment of non-aqueous redox flow batteries (RFBs) for grid-scale energy storage has been impeded by a lack of electrolytes that undergo redox events at very low (anolyte) or high (catholyte) potentials while exhibiting the stability and cycling lifetimes necessary for a battery device. While at the University of Utah with Shelley Minteer and Matthew Sigman, Dr. Hickey recently reported a new approach to electrolyte design that uses physical organic tools for the predictive targeting of RFB electrolytes that possess this desirable, yet elusive, combination of properties. Dr. Hickey will discuss the application of this approach to identification of a new pyridinium-based anolyte that undergoes $1e^-$ electrochemical charge-discharge cycling at low potential (-1.21 V vs. Fc/Fc^+) to a 95% state-of-charge without detectable capacity loss after 200 cycles.

Thursday, October 3, 2019
12:00 NOON
Room 1400 – Biomedical & Physical Sciences

Pizza and refreshments provided starting at 11:45 a.m.