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Department of Chemistry
Presents

The 2018 Franklin Award Lecture

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Developing and Applying New Tools to Understand How Materials for Li and "beyond-Li" batteries and Supercapacitors Function.

Host: Dr. Stephen Koch

Friday, January 26, 2018

3:00 PM

Charles B. Wang Center ✦ Theater

✦ Reception at 2:30 PM in Wang Center Theater lobby ✦

Abstract:

The development of light, long-lasting rechargeable batteries (and the invention of the lithium-ion battery, now 25 years ago) has been an integral part of the portable electronics revolution. This revolution has transformed the way in which we communicate and transfer and access data globally. Rechargeable batteries are now playing an increasingly important role in transport and grid applications, but the introduction of these devices comes with different sets of challenges. New technologies are being investigated, such as those using sodium and magnesium ions instead of lithium, and the flow of materials in and out of the electrochemical cell (in redox flow batteries). Importantly, fundamental science is key to producing non-incremental advances and developing new strategies for energy storage and conversion.

This talk will focus on our work in the development of methods that allow devices to be probed while they are operating (i.e., *in-situ*). This allows, for example, the transformations of the various cell components to be followed under realistic conditions without having to disassemble and take apart the cell. To this end, the application of new *in* and *ex-situ* Nuclear Magnetic Resonance (NMR), magnetic resonance imaging (MRI) and X-ray diffraction approaches to correlate structure and dynamics with function in lithium- and sodium-ion batteries and supercapacitors will be described. The *in-situ* approach allows processes to be captured, which are very difficult to detect directly by *ex-situ* methods. For example, we can detect side reactions involving the electrolyte and the electrode materials, sorption processes at the electrolyte-electrode interface, and processes that occur during extremely fast charging and discharging. Complementary *ex-situ* investigations allow more detailed structural studies to be performed, to correlate local and long-range structure with performance.

For more information please call the Department of Chemistry at 632-7884 or contact Norma Reyes at Norma.Reyes@stonybrook.edu.