ADVANCED ELECTROCHEMICAL ENERGY STORAGE SYSTEMS AND NANOSTRUCTURED MATERIALS

This seminar will discuss important cross-cutting, fundamental materials science and materials chemistry challenges for large scale electrical energy storage. First, the current status and challenges for electrical energy storage will be briefly reviewed. In particular, the requirements and directions for automobile (transportation), renewable and grid (stationary) applications will be compared, together with an overview of the different energy storage technologies being investigated. The seminar will then summarize our recent progresses in materials synthesis, characterization and modeling of advanced nanostructured materials for Li-ion, Li-S, Li-air and Na-ion battery applications. The synthetic efforts are based on the fundamental understanding of the interfacial reactions, controlled nucleation and growth, and multicomponent self-assembly approaches. The characterization is focused on the development of in-situ transmission electron microscopy and nuclear magnetic resonance techniques. The computer modeling and simulation provide atomistic understanding of structural evolution and reaction pathways.

Dr. Jun Liu is a Laboratory Fellow at the Pacific Northwest National Laboratory. He has also been the Leader for the Transformational Materials Science Initiative, and in this capacity, he provides oversight of the scientific directions for the large integrated energy storage program at PNNL. Jun Liu is a Fellow for the American Association for the Advancement of Science and a Fellow for the Materials Research Society. In the past he has served as senior research staff for Sandia National Laboratories and Lucent Bell Laboratories, Department Manager for the Synthesis and Nanomaterials, Thrust Leader for Complex Functional Nanomaterials for the Center for Integrated Nanotechnologies, Sandia National Laboratories. His main research is in self-assembled, functional nanomaterials, oriented nanostructures, and the application of these materials for large scale energy storage, catalysis, environment cleanup and human health. He has received two R&D 100 Awards, two Basic Energy Science Materials Science Awards for Materials Chemistry: Significant Implication for DOE-Related Technologies, and was named 2007 Distinguished Inventor of Battelle. He has over 280 publications and many invited review or feature articles in leading technical journals. His research has been widely reported by Science, Nature, Scientific America, Chemical & Engr News, Discover, Wall Street Journals, and many other leading professional and trade journals.