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LAPME Seminar

Exploration and optimization on the structural properties of cathode materials based on neutron scattering methods



25 October 2024

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Venue: N23-6009

Time: 15:00 - 16:00

Hosted by: Prof. Haifeng LI

Abstract

Although the research on the cathode materials for lithium-ion and sodium-ion batteries has attracted extensive interest, the deep understanding on their structural properties and the insight into their structural evolution are still lack. By taking advantages of sensitive, penetrative and nondestructive properties of neutrons, we adopted ex-situ and in-operando neutron diffraction techniques to explore the structural characteristics of cathode materials of lithium and sodium-ion batteries, especially the structural evolution of cathodes during cycling in real time. It is revealed that structural defects formed in cathodes and they varied upon charging and discharging. Moreover, the visualization of the ion migration pathway in cathode indicated that ions diffused via different hopping paths at different states of charge. Based on the relationship between structural and electrochemical properties of cathode materials, we modified and optimized the performances of cathodes by adopting different synthesis procedures, which are of scientific and practical significance. Besides of the research on cathode materials, the construction progress of Peking University High Resolution Neutron Diffractometer at China Spallation Neutron Source will also be presented.

Biography

Prof. Yinguo Xiao received his Ph.D. degree from Institute of Physics, Chinese Academy of Sciences, China in 2006. He was a postdoctoral fellow from 2007 to 2009 and a research scientist from 2009 to 2014 at Juelich Research Centre (Forschungszentrum Jülich), Germany. He was promoted to tenured staff scientist in Juelich Research Centre since 2015. In 2017, he joined Peking University Shenzhen Graduate School, China, as an associate professor. His research interests are on research and development of energy materials, magnetic materials, and characterization of complex materials using X-ray and neutron scattering techniques. He is also in charge of designing and constructing the Peking University High Resolution Neutron Diffractometer at the China Spallation Neutron Source. Presently, he is responsible for the National Key R&D Program of China, projects supported by the National Natural Science Foundation of China, and projects supported by department of science and technology of Guangdong province and Shenzhen city. To date, he has published over 160 peer-review papers and 3 book chapters in the research areas of materials and neutron science.