

In-situ and In-operando diffraction Studies of Li Ion Battery Electrodes

Gwenaelle Rouse

Sorbonne Université - Collège de France, PARIS cedex 5, France;

gwenaelle.rousse@sorbonne-universite.fr

Rechargeable lithium ion batteries, because of their high energy density, have conquered most of today's portable electronics. The development of electric transportation also largely relies on the development of such devices. Still, there is plenty of room for improvement since the energy density is far from being enough for long-driving distances. The same applies for the sister technology, Na-ion, which could become the technology of choice for stationary storage in a near future. For all these applications, finding new electrode materials and being able to follow their structural evolution on charge and discharge is essential. In this talk, I will first present the strategy we use at the lab "Chimie du Solide et Energie" at Collège de France (Paris) to get useful information from diffraction experiments on battery materials, and how important a rigorous analysis of these data is for a reliable characterization of electrodes materials. From examples based on neutron and X-ray powder diffraction, I will highlight the importance of conducting structural studies, both to understand the as-made electrodes and their behaviour on cycling. Importance of crystallography and diffraction experiments will also be highlighted in the field of ionic conductors, as an important step towards the development of safe all-solid-state batteries. Lastly, it will be shown that other communities – e.g. solid state physicists- may benefit from research in materials for batteries with the discovery of compounds presenting interesting magnetic properties.

Keywords: Batteries, powder diffraction, inorganic compounds