Quasielastic Neutron Scattering: A tool to explore ionic motion in energy materials

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Abstract

Quasielastic neutron scattering (QENS) is a powerful technique to study the microscopic dynamics of ions in both solid and liquid electrolytes, providing an excellent complement to macroscopic measurements such as impedance spectroscopy. Due to the high scattering cross sections of protons, the technique is particularly well adapted to study proton conductors. Nevertheless, thanks to the instrumental developments of the last two decades, QENS can now be applied also to follow the diffusion of Li and Na in new battery materials or to investigate the oxide motion in oxide ion conductors or mixed ion conductors. In this lecture, the basics of QENS will be reviewed, together with its advantages and disadvantages to investigate the dynamics of energy materials, before showing a few representative examples applying QENS to study proton conducting perovskites, solid electrolytes used in solid oxide fuel cells, liquid electrolytes, etc.

Bio

Miguel A. González has been a member of the Scientific Computing group at the Institut Laue-Langevin (ILL) in Grenoble, France, since 2007. Previously he also served at the ILL as an instrument scientist on IN10, IN16 and D1B. Presently, he associates an activity in several software projects related to neutron data reduction and analysis with a scientific career combining neutron scattering and computer simulations to investigate the structure and dynamics of molecular crystals and disordered systems. His current research interests encompass the study of molecular motions in drugs and inclusion compounds of pharmaceutical interest, the exploration of the structure and dynamics of room temperature ionic liquids, and the examination of novel ionic conductors for battery applications.