SOFC materials as seen by neutrons

Dr. Stanislav SAVVIN

XtremeD Instrument Responsible, Instituto de Nanociencia y Materiales de Aragón, Zaragoza, Spain

savvin@ill.fr

Abstract

Ongoing climate change of technogenic nature is one of the greatest challenges the modern society has been facing for decades now. Carbon-based energy vectors employed around the globe until recently resulted in uncontrolled release into the atmosphere of huge amounts of long-lived carbon dioxide putting the whole planetary climatic system in danger. State-of-the-art carbon neutral energy sources range from nuclear power to renewable energy systems based on wind, solar, geothermal or tidal energy. Fuel cells are another example of very promising environment-friendly energy conversion and storage technology. This talk will focus on the applications of neutron diffraction for the study of ionically conducting solids with particular emphasis on ceramic oxygen-ion and proton conductors. These represent the cornerstone of the Solid Oxide (SOFC) and Proton Conducting (PCFC) Fuel Cell technologies defining the net efficiency and long-term stability of fuel conversion plants. Because of its extremely high sensitivity to light elements neutron scattering is an ideal tool for probing the crystal structure of oxygen-ion and proton conducting oxides as well as mechanisms of ion transport therein. Examples of such analysis will be given in the context of energy storage/conversion applications.

Bio

After getting his PhD from Lomonosov Moscow State University, Russia, in 2005, Dr. Savvin joined the Solid Oxide Fuel Cell and Ceramic Materials research group at the University of La Laguna, Spain, as a Postdoctoral Fellow. Later in 2016, he took up the post of a Research Associate in the Functional Materials group at the University of Liverpool, UK. From 2018 to 2022, Dr. Savvin held the post of the D2B Instrument Co-responsible at the Institut Laue-Langevin, France. From 2023 on Dr. Savvin is in charge of XtremeD, new Spanish CRG powder and single-crystal diffractometer, featuring high neutron flux and quick data acquisition for the studies of materials structure at extreme temperatures, magnetic fields and pressures. Dr. Savvin's scientific interests lie primarily in the area of synthesis, physical and structural characterization of new functional

materials such as oxygen-ion and proton conductors, thermoelectrics and magnetically ordered systems. His research seeks establish structure-property relationships in the above families of compounds using neutron diffraction under ambient and extreme conditions.