

Abstract Submitted
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QENS Investigation of Proton Diffusion in Sr/Ca-doped LaPO₄

AMAL AL-WAHISH, Department of Physics and Astronomy, UTK, N. JALARVO, Neutron Scattering Sciences Division, ORNL, Z. BI, C. BRIDGES, M.P. PARANTHAMAN, Chemical Sciences Division, ORNL, A. HUQ, K. HERWIG, Neutron Scattering Sciences Division, ORNL, D. MANDRUS, Materials Science and Engineering, UTK. — We have investigated the diffusion dynamics of protons in hydrated La_{0.958}Sr_{0.042}LaPO₄ and La_{0.958}Ca_{0.042}LaPO₄. These materials contain networks of tetrahedra rather than octahedra and relatively little is known about the mechanisms of proton transport in such systems. The samples were characterized by X-ray powder diffraction (XRD), thermogravimetric analysis (TGA), and neutron powder diffraction (NPD) from room temperature to 800 °C. The macroscopic and microscopic dynamics were studied using electrochemical impedance spectroscopy (EIS) and quasielastic neutron scattering (QENS). The activation energy characterizing the proton diffusion was determined in the temperature range 500-700 °C using both QENS and EIS. For La_{0.958}Ca_{0.042}LaPO₄, QENS reveals a dynamical process that was not detected by EIS. The QENS activation energy was determined to be 0.09 eV, roughly an order of magnitude lower than the ~ 1 eV inferred from EIS measurements. We will present results from the EIS, NPD and QENS analysis of the samples.

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