

Dynamics in functional oxide ion conductors studied with INS and QENS

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Over the past two decades, the study of solid oxide electrolytes and their usage in various technological applications, such as batteries, chemical sensors, and fuel cells has developed into an extremely important field within materials science research. This development is driven by the need for cleaner and more sustainable sources of energy, which is one of the grand challenges in the 21st century. However, a too low ionic conductivity, and/or a too low chemical stability under operating conditions, of present-day oxide electrolytes often limit their wider use. The development of new, more highly ion conducting oxides is hence critical to future breakthroughs. This requires an increased understanding of the underlying mechanisms of ionic conduction, and in this regard inelastic and quasielastic neutron scattering (INS and QENS, respectively) play an important role. In this contribution, I will summarize recent progresses in relation to the structural and dynamical study of solid oxide ion conductors, using INS and QENS, as well as to discuss challenges and opportunities within this field of research. A special focus will be given on proton conducting perovskite type oxides, because of their high promise for application in technological devices, as well as the emerging class of solid oxide electrolytes based on oxide-hydrides.

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