

Neutron scattering studies of structure and dynamics of proton conducting perovskites for next-generation fuel cells

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Understanding the fundamental properties of materials of relevance for alternative energy technologies is crucial in addressing the global challenge of cleaner sources of energy. In this presentation I aim to demonstrate the important role that neutron scattering now plays in advancing the state of the art of the fundamental understanding of proton conducting oxides, which show potential to be used as electrolytic membranes in next-generation, environmentally friendly, fuel cells, operating in the intermediate temperature range from ~ 200 to ~ 500 °C [1]. In particular, the breadth of recent neutron scattering work on perovskite type oxides, which continue to be considered as the most promising materials for intermediate temperature applications [2], is reviewed. Key fundamental properties that are addressed include crystal structures and proton sites, hydrogen-bonding interactions, and proton dynamics. Techniques, which are touched upon, are neutron diffraction, neutron total scattering, and in- and quasi-elastic neutron scattering. Furthermore, the perspectives for future neutron studies within this field of research [3] are discussed.

[1] L. Malavasi, C. Fisher, S.M. Islam, Chem. Soc. Rev. 39 (2010) 4370.

[2] E. Fabbri, L. Bi, D. Pergolesi, E. Traversa, Adv. Mater. 24 (2012) 195.

[3] M. Karlsson, Dalton Trans. 42 (2013) 317.

Primary author: Dr KARLSSON, Maths (Chalmers University of Technology)

Presenter: Dr KARLSSON, Maths (Chalmers University of Technology)

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