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Synthesis and structural characterisation of novel perovskite-type Na-ion conductors

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The development of new solid electrolytes is becoming increasingly important, e.g., for rechargeable batteries for electric vehicles, where current liquid organic electrolytes cause major safety concerns. Some ABO₃ perovskite metal oxides have shown excellent lithium and sodium ion conductivity owing to their chemical and structural flexibility. This has led to the development of several perovskite-type solid electrolytes such as Li₃xLa_{2/3-x}TiO₃ (LLTO) and Na_{1/2-x}La_{1/2-x}Sr_{2x}ZrO₃ (NLSZ), which have shown high ionic conductivities [1-3].

Starting from the $x = 1/6$ member of NLSZ, a new series of sodium perovskite-type solid electrolytes with the formula Na_{1/3}La_{1/3-x/3}Sr_{1/3}Zr_{1-x}Nb_xO₃ ($0 \leq x \leq 0.8$) (NLSZN) was synthesised. Structural characterisation was carried using a combination of synchrotron and neutron powder diffraction data, which revealed both first- and second-order phase transitions as a function of temperature. For some samples the symmetry appeared higher in synchrotron data than neutron data, owing to the higher relative sensitivity of neutron data to scattering from oxygen atoms in the structure [4]. As observed for other defect perovskites, there is a tendency to higher symmetry with increasing A-site vacancy concentration [5].

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Presenter Gender

Man

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Australian Centre for Neutron Scattering

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