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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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Level of Expertise

Student

Presenter Gender

Man

Pronouns

He/Him

Which facility did you use for your research

Australian Centre for Neutron Scattering

Students Only - Are you interested in AINSE student funding

Yes

Do you wish to take part in the Student Poster Slam

Yes

Condition of submission

Yes

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