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Synthesis-Controlled Polymorphism and Magnetic Properties of Li3Co2SbO6

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Li3Co2SbO6 has been synthesized using high temperature solid-state methods. Li3Co2SbO6 is found to adopt two highly distinct structural forms: a pseudohexagonal (monoclinic C2/m) layered O3-LiCoO2 type phase with "honeycomb" 2:1 ordering of Co and Sb, and an orthorhombic Fddd phase, isostructural with Li3Co2TaO6 but with the addition of significant Li/Co ordering. Pure samples of both phases can be obtained by conventional solid-state synthesis via a precursor route using Li3SbO4 and CoO, by controlling particle size, initial lithium excess, and reaction time. Both phases show relatively poor performance as lithium-ion battery cathode materials in their as-made states, but complex and interesting low-temperature magnetic properties.

The monoclinic honeycomb phase is the first of its type to show A-type antiferromagnetic order (ferromagnetic planes, antiferromagnetically coupled), with TN = 14 K. Isothermal magnetisation and in-field neutron diffraction below TN show clear evidence for a metamagnetic transition at H ≈ 0.7 T to three-dimensional ferromagnetic order. The orthorhombic phase orders antiferromagnetically below TN = 112 K and then undergoes two more magnetic phase transitions at 80 and 60K. Neutron diffraction data show that the ground state is incommensurate.

In this presentation the crystal structures of both polymorphs of Li3Co2SbO6 will be discussed as elucidated by X-ray powder diffraction and neutron powder diffraction. The low-temperature magnetic ground-states and magnetic behaviour, including in-field metamagnetism displayed by the honeycomb phase will also be discussed.

Speakers Gender

Male

Level of Expertise

Student

Do you wish to take part in the poster slam

Yes

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