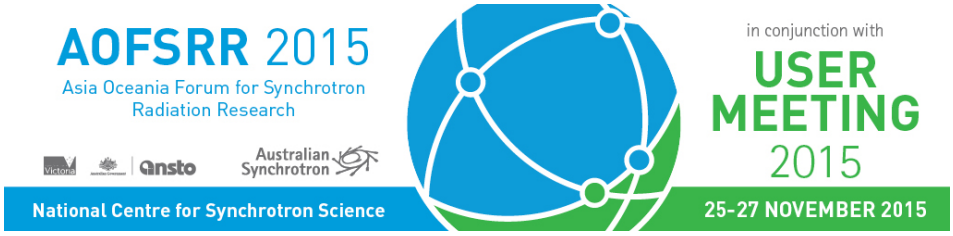

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Synthesis and Characterisation of (M1-xFex)2SnO4 (M = Mn, Co, Zn) ternary transition metal-tin-oxygen spinel systems

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Mixed transition-metal oxide (MTMO) spinels including Mn and Zn-metal containing stannate phases have promising material properties and are known for the ability to tailor particular features for different uses. They are currently being explored as possible alternative substrates in many emerging high-tech applications such as electrode materials in lithium-ion batteries and as conducting oxides in gas detector sensors. The project aims to study the crystal and magnetic structures of iron and tin containing quaternary stannate to produce the novel spinel structures (M1-xFex)2SnO4 (M = Mn, Zn and $0 \leq x \leq 1$). Synchrotron X-ray and neutron powder diffraction, Mn and Fe K-edge XANES, Mössbauer, IR and UV-Vis spectroscopy data, magnetic measurements and SEM/EDX have been performed on the (M1-xFex)2SnO4 systems to find out the exact mechanism of Fe substitution, how much Fe and in what oxidation state is substituted and the effects upon the crystal and magnetic structure. For the range of (Zn1-xFex)2SnO4 spinels, initial results support the hypothesis that there is more than one doping mechanism, which is dependent upon the amount of Fe that is doped. Diffraction results and Mössbauer data indicate that an enrichment of Fe relative to Sn is evident in the Fe-rich structures, which might be due to Fe replacing Zn followed by Sn as more Fe becomes present in the system.

Keywords

Fe and Mn XANES, Powder diffraction, Sn spinel

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