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Phase Transition studies of $\text{MnSb}_{2-x}\text{Ta}_x\text{Sb}_2\text{O}_6$

Recently, the trigonal modification (sg. P321) of MnSb_2O_6 has drawn significant attention as it could be an unusual type of multiferroic behaviour and weakly polar material [1]. The magnetic susceptibility of MnSb_2O_6 shows a short range ordering below 200 K and long range ordering is observed below the Neel temperature ($T_N = 12.5$ K) resulting in an incommensurately ordered three-dimensional Heisenberg antiferromagnet [2]. MnTa_2O_6 adopts the orthorhombic MgNb_2O_6 structure type (sg. Pbcn) and it shows a monoclinic magnetic structure: $P2_1/c$ symmetry at 4.2 K ($T_N = 4.4$ K) [3]. In this solid solution, Ta could occupy the MnO interlayers and it will induce the decrease of the magnetic inter layer coupling. According to the Lab X-ray diffraction studies, a new tetragonal modification can be observed between $x = 0.2$ and 1.8. The powder can be refined as mixtures of the trigonal MnSb_2O_6 structure and a tetragonal tri-rutile modification, which is known for other MSb_2O_6 compounds, for the refinement from $x = 0.6$ to $x = 1.2$. The tri-rutile modification could be refined as the sole phase between $x = 1.4$ to 1.6. The orthorhombic MnTa_2O_6 modification could only be observed from $x = 1.7 - 2.0$. Interestingly, the tri-rutile modification has previously been described as a meta-stable modification for MnTa_2O_6 [4].

References

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