Structural and Magnetic Characterisation of $Bi_2Sr_{1.4}La_{0.6}Nb_2MnO_{12}$.

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A new Aurivillius phase (generic formula $M_2A_{n-1}B_nO_{3n+3}$) has been synthesized with n=3 and containing manganese, $Bi_2Sr_{1.4}La_{0.6}Nb_2MnO_{12}$. The structure has been investigated by X-ray and neutron powder diffraction and found to be tetragonal (*I4/mmm*) at temperatures down to 2K, with a = 3.89970(7) Å, c = 32.8073(9) Å at 2K. There is significant cation disorder between Bi^{3+} (predominantly on the *M* sites) and Sr^{2+} and La^{3+} which prefer the *A* sites: 19(2)% of Bi^{3+} occupy the *A* sites. This disorder, leading to occupancy of *M* sites by Sr^{2+}, is thought to relieve strain due to size-mismatch between the fluorite-like and perovskite-like blocks. A high level of order exists between Mn and Nb on the *B* sites, with Mn located predominantly (76.1(6)%) in the central *B* site whilst Nb preferentially occupies the lower symmetry, outer *B* site, where it undergoes an out-of-centre displacement towards the fluorite-like blocks. Magnetic measurements indicate that this material displays spin-glass behaviour on cooling. Synthesis of the Mn^{4+} analogue $Bi_2Sr_2Nb_2MnO_{12}$ was unsuccessful, possibly due to the small size of the Mn^{4+} cation.