

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Large crystal-symmetry-induced magnetoelectric coupling in the quadruple perovskite $\text{BiMn}_3\text{Mn}_4\text{O}_{12}$ A. GAUZZI, G. ROUSSE, Univ. Pierre et Marie Curie, F. MEZZADRI, G. CALESTANI, Parma Univ., G. ANDRE, F. BOUREE, LLB CEA-CNRS, M. CALICCHIO, E. GILIOLI, R. CABASSI, F. BOLZONI, A. PRODI, IMEM-CNR, P. BORDET, Inst. Neel-CNRS, M. MAREZIO, CRETA-CNRS — The remarkable properties of manganese oxides AMnO_3 with perovskite structure, such as the colossal magnetoresistance and the multiferroicity, arise from peculiar charge, spin and orbital orderings of the Mn e_g electrons driven by cooperative Jahn-Teller distortions of the MnO_6 octahedra. Mastering these orderings remains a challenge owing to local structural distortions and electronic inhomogeneities enhanced by chemical substitutions and oxygen defects. We show that these difficulties are absent in *quadruple* perovskites $\text{AMn}_3\text{Mn}_4\text{O}_{12}$. These compounds share with *simple* perovskites AMnO_3 a similar pseudo-cubic network of corner-sharing MnO_6 octahedra and similar electronic properties associated with the Mn^{3+} and Mn^{4+} ions. However, they display smaller distortions thanks to the higher crystal symmetry and no defects. For $A=\text{Bi}$, by means of neutron powder diffraction we give direct crystallographic evidence of a large coupling between the electric dipole of the 6s lone pair of Bi^{3+} and the magnetic structure of the Mn^{3+} ions, which provides a hint for enhancing the magnetoelectric coupling in proper ferroelectrics in view of multiferroic applications.

Andrea Gauzzi

Date submitted: 19 Nov 2010

Electronic form version 1.4