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Structural and Magneto-electric properties of substituted $R\mathbf{MnO_3}$ crystals (R=*Sm, Gd)* G. BALAKRISHNAN, D. O'FLYNN, DA-QIAN LIAO, R.A. MCKINNON, D.S. KEEBLE, M.R. LEES, Department of Physics, University of Warwick, UK, A. DAOUD-ALADINE, ISIS Facility, STFC, Didcot, UK
— In order to understand the emergence of multiferroic behaviour in the $R\mathrm{MnO_3}$ type compounds, it is educational to study the relationship between ferroelectricity and magnetoelastically induced lattice modulations. The Mn-O-Mn bond angle is a crucial parameter in these systems and it varies with the ionic radii (r_R) of the R atoms. Multiferroic behaviour may be induced in large Rsystems by substituting the R site with a smaller ion (e.g. *Y, Lu*). We have studied the effect of substituting Y in $Sm\mathrm{MnO_3}$ and Lu in $Gd\mathrm{MnO_3}$ respectively. In the optimally substituted compounds, we observe a strong coupling between the magnetic and dielectric properties. We have investigated the local structural distortions in the $\mathrm{MnO_6}$ octahedra in both these systems using single crystal X-ray studies. Additionally, neutron powder diffraction has been used to investigate the nature of the low temperature magnetic ordering in the Sm system. Investigations of the dielectric properties of the Y and Lu substituted crystals reveal anomalies in the dielectric properties coincident with an additional magnetic transition, indicative of multiferroic behaviour. We present detailed investigations of the magnetic, dielectric and structural properties on single crystals of selected compositions.

G. Balakrishnan

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