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Enhanced magnetization in the $BiFeO_3$-$RMnO_3$ thin films

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The monolithic $BiFeO_3$ (BFO) is claimed to be multiferroic at room temperature, but only a weak magnetization and moderate polarization are observed. The co-doping of BFO is a way to improve electrical properties as well as magnetization. Thin films of the $BiFeO_3$-$RMnO_3$ (R = rare earth) system affords an interesting combination of good ferroelectric polarization and magnetization properties at room temperature that are a prerequisite for intrinsic multiferroism. Particularly, the addition of $GdMnO_3$ leads to a substantial increase in magnetization that experimentally allows the determination of Néel temperature (TN). The origin of magnetization improvement will be discussed in terms of Gd substitution effects on octahedral distortion and tilting.

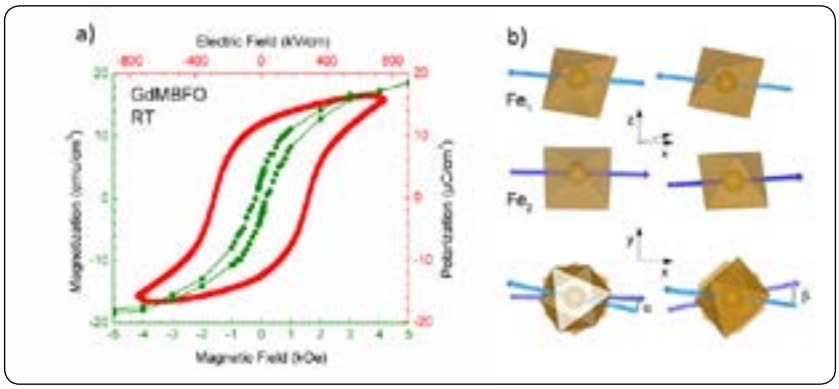

Figure: (a) Simultaneous presence of ferroelectric and magnetic properties in GdMBFO. (b) Simple representation of how motion of oxygen cages would lead to rotation of octahedra and increase in the octahedral angle from α angle for pure BFO to β angle for GdMBFO.

Recent Publications

1. Lahmar A (2017) Multiferroic properties and frequency dependent coercive field in $BiFeO_3$-$LaMn_{0.5}Co_{0.5}O_3$ thin films. Journal of Magnetism and Magnetic Materials 439:30–37.
2. Lahmar A and Es Souni M (2015) Sequence of structural transitions in $BiFeO_3$-$RMnO_3$ thin films (R= rare earth), Ceramics International 41(4):5721–5726.
3. Lahmar A, et al. (2009) Effect of rare earth manganites on structural, ferroelectric and magnetic properties of $BiFeO_3$. Applied Physics Letters 94(1):012903.

Biography

Lahmar Abdelilah received his Doctorate in Science in Materials Chemistry in 2007 from University of La Rochelle (France)/University Mohammed V (Morocco). Subsequently he worked at the Institute for Materials and Surface Technology (IMST) in Kiel (Germany) until 2012. Then he moved to Amiens, in Laboratory of Condensed Matter Physics, where he obtained his Habilitation thesis in 2017. His research interests encompass a broad range of multifunctional materials (multiferroic, electrocaloric, and magnetoelectrics). He has published more than 50 papers published in peer reviewed journals and contributed to numerous international conferences.

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