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Origin of the magnetic-field controlled polarization reversal in multiferroic $TbMn_2O_5$[1] N. LEO, University Bonn, Germany, D. MEIER, UC Berkeley, USA, R.V. PISAREV, Ioffe Institute, St. Petersburg, Russia, S. PARK, S.-W. CHEONG, Rutgers University, USA, M. FIEBIG, University Bonn, Germany — The interplay of multi-dimensional complex magnetic order parameters leads to interesting effects like magnetically induced ferroelectricity. A particular interesting example is $TbMn_2O_5$ because of the associated magnetic-field controllable electric polarization. By optical second harmonic generation we show that the gigantic magnetoelectric effect originates in three independent ferroelectric contributions. Two of these are manganese-generated. The third contribution is related to the magnetism of the Tb^{3+} sublattice and has not been identified so far. It mediates the remarkable magnetic-field induced polarization reversal. This model is verified by experiments on the isostructural YMn_2O_5 where Y^{3+} ions are nonmagnetic and only two polarization contributions are present and no magnetoelectric coupling is observed. These results underline the importance of the $3d-4f$-interaction for the intricate magnetoelectric coupling in the class of isostructural RMn_2O_5 compounds.

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Naëmi Leo
University Bonn

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