Multiferroic manganites and ferrites with perovskite structure

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Multiferroic materials with both ferroelectric and (anti)ferromagnetic orders have recently attracted great interest since the discovery of ferroelectric polarization in $TbMnO_3$ and the polarization flop induced by a magnetic field [1]. It has been well that ferroelectric polarization can be induced by either symmetric or antisymmetric exchange interactions. In this presentation, we will discuss two prototypical examples of ferroelectric polarization induced by symmetric exchange striction. The first example is the orthorhombic perovskite-type manganites with small *A*-site ionic radius, which show E-type magnetic structures. These materials can be obtained only with the use of high pressure synthesis technique. The systematic investigations on orthorhombic manganties with varied *A*-site ionic radius enabled us to construct a phase diagram and to evaluate the polarization values, which are more than ten times as large as those observed for *bc*-cycloidal manganite [2]. The second one is the orthorhombic ferrite $GdFeO_3$ which is a well known material for its characteristic lattice distortion. In this material, we found that polarization shows up below the Neel temperature of Gd moment, and that the ground state of this material is in fact multiferroic [3]. In this material, we could mutually control the magnetization and polarization with electric- and magnetic field, and attributed the controllability to novel composite domain walls.

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