EB06

Magnetoelectric Couplings in Core/shell $BaTiO_3/Fe_3O_4$ Particles

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During last several years, there have been lots of interests in multiferroic materials, in which more than two order parameters coexist and coupled, due to their intriguing magnetoelectric coupling and possible applications, such as transducer and new memory. To enhance the magnetoelectric coupling near room temperature by using low electric or magnetic fields, lots of new single crystals, thin films, composites have been proposed and heavily investigated. Especially, Ramesh group [1] have reported the change of magnetization near the ferroelectric transition temperature and the change of magnetic easy axis under electric field in nano-pillar $CoFe_2O_4$ embedded $BaTiO_3$ thin films. Successively, several group reported the change of magnetization in magnetic oxides thin film on top to ferroelectric substrates, such as Fe_3O_4 film on $BaTiO_3$ substrates.

To enhance the mechanical coupling for amplified magnetoelectric coupling, we have studied core/shell particles, which composted of ferroelectric and ferromagnetic materials [2]. In this work, we report the change of electrical and magnetic properties of Fe_3O_4 shell near the structural transition of $BaTiO_3$ shell through magnetoresistance and magnetization measurements. Although the magnetization change is comparable to the earlier report [1], the observation of large magnetoresistance changed even below a percolation limit could be a novel phenomenon in core/shell structure.

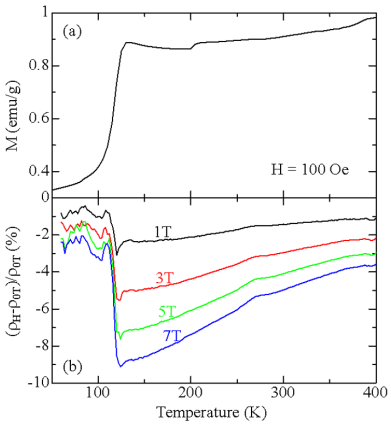

Fig. 1. (a) Magnetization and (b) Magnetoresistance vs T.

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EB07

Electrical and Magnetic Properties of $BiFeO_3$ Multiferroic Ceramics

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The multiferroic $BiFeO_3$ has been investigated in thin film and ceramic form intensively. However, the synthesis of perfect sample with high resistivity is still a prerequisite for clarification of its properties. Here we report the synthesis process and its structural, electrical and magnetic properties in ceramic form. The polycrystalline ceramic samples of $BiFeO_3$ were synthesized by solid state reaction using high purity oxides and carbonates. The formation of single phase compound was confirmed by x-ray diffraction and its lattice parameters were determined using the standard computer program. The microstructural studies and its density measurement verified that the prepared samples were dense enough for investigation of its electrical and magnetic properties. The dc electrical conductivity studies show that the sample is resistive with an activation energy of ~ 0.81 eV. Magnetization measurement shows linear (M~H) curve indicating an antiferromagnetic character. The results are discussed in detail.