Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Enhanced ferromagnetism in co-doped $BiFeO_3$ceramics HARSH TRIVEDI, DEEPA SINGH, Materials Science Programme, Indian Institute of Technology Kanpur, RAJEEV GUPTA, Department of Physics, Indian Institute of Technology Kanpur, ASHISH GARG, Materials Science Engineering, Indian Institute of Technology Kanpur — $BiFeO_3$ (BFO) is the most studied multiferroic material with high ferroelectric polarization as well above room temperature transition temperatures. Studies have shown significant improvements in the electrical and magnetic properties of BFO upon atomic substitutions at Bi (A) and Fe (B) sites. While enhanced ferromagnetism upon A-site doping is attributed to the suppression of cycloidal spin ordering of Fe moments, B site substitution reduces leakage current by eliminating oxygen vacancies. This study aims to combine these two aspects by co-doping the material at A- and B- sites using La^{3+} and V^{3+}/V^{+5} respectively and to investigate the electrical and magnetic characteristics of co-doped BFO. La-doped $La_xBi_{1-x}FeO_3$ and co-doped $La_xBi_{1-x}V_yFe_{1-y}O_3$(x = .05, 0.1, 0.15, 0.2; y = 0.03) samples were prepared solid-state reaction method. While La-doped samples show only reduced leakage without any discernible change in the magnetic characteristics, co-doped samples (La^{3+}& V^{5+}) show significant enhancements in magnetic properties in addition to reduced leakage attributed to the elimination of oxygen vacancies. Improvement in the magnetic characteristics can be understood as a consequence of enhanced double exchange interaction between adjacent Fe ions. This argument is further strengthened by our observation that co-doped samples made by substitution of Fe with V^{+3} show a magnetic response equivalent to that of only La-doped BFO samples.

Rajeev Gupta
Department of Physics, IIT Kanpur

Date submitted: 11 Nov 2011 Electronic form version 1.4