Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Correlation between magnetocapacitance effect and polarization flop direction in a slanted magnetic field in $Tb_{1-x}Dy_xMnO_3$ NOBUYUKI ABE, HAJIME SAGAYAMA, HIROSHI UMETSU, TAKA-HISA ARIMA, IMRAM, Tohoku University, KOUJI TANIGUCHI, Department of Advanced Materials Science, The University of Tokyo — Recent extensive studies show that the cycloidal spin system can possess electric polarization through the spin-orbit coupling. The magnetoelectric coupling in multiferroics is enhanced by the clamping of helimagnetic and ferroelectric domain walls. For example, $DyMnO_3$ shows a gigantic magnetocapacitance effect caused by the microscopic motion of multiferroic domain walls at a magnetic field induced $\boldsymbol{P}$-flop transition. In contrast, the enhancement of capacitance at the $\boldsymbol{P}$-flop transition is much smaller in $TbMnO_3$. Here, we show the systematic control of magnetocapacitance effect in helimagetic ferroelectric $Tb_{1-x}Dy_xMnO_3$ as a function of the composition ratio x and the intensity of the applied magnetic field. It has been also found that the rotation direction of $\boldsymbol{P}$ in a slanted magnetic field changes with x and H. The crossover between small and large enhancement in magnetocapacitance corresponds to the switch in the $\boldsymbol{P}$-flop direction. The correlation can be explained by assuming the mobility of domain wall would be dominated by the thickness of domain walls in a helical magnet.

Nobuyuki Abe
IMRAM, Tohoku University

Date submitted: 17 Nov 2010 Electronic form version 1.4