

MAR17-2016-001599

Abstract for an Invited Paper
for the MAR17 Meeting of
the American Physical Society

Giant spin-induced polarization and optical-diode effect by electromagnons in BiFeO₃

JUN HEE LEE, Ulsan National Institute of Science and Technology

Type-*I* multiferroics where spin and electric polarization order at distinct temperatures were believed to have smaller couplings between them compared to type-*II* multiferroics such as TbMnO₃. However, we recently discovered unexpectedly huge couplings between spin and electric polarization in representative type-*I* multiferroic BiFeO₃. This hidden coupling leads to record-high spin-induced ferroelectric polarizations ($\sim 3.0 \mu\text{C}/\text{cm}^2$) [1] which is one or two order larger than in any other multiferroics. Also, the spin-polarization couplings in *dynamic* region [2] generates strong electromagnons resulting in sizable one-way optical transparency at the spin-wave excitations [3]. Overall, we show how our theoretical results revive studies in revealing hidden but huge spin-polarization couplings and their dynamic interactions with light in type-*I* multiferroics. [1] J. H. Lee and R. Fishman, Physical Review Letters, 115, 207203 (2015). [2] J. H. Lee, I. Kezsmarki, and R. Fishman, New Journal of Physics 18, 043205 (2016). [3] R. Fishman, J. H. Lee *et al.*, Physical Review B, 92, 094422 (2015). *This work has been done by collaborations with R. Fishman (ORNL) and I. Kezsmarki (U of Budapest).