Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

High Optical Performance and Practicality of Active Plasmonic devices based on Rhombohedral $BiFeO_3$[1] PHUONG-KHUONG ONG, HONG-SON CHU, Institute of High Performance Computing, A-STAR, DAVID SINGH, Materials Science and Engineering Division Oak Ridge National Laboratory, JOHN WANG, Department of Materials Science and Engineering National University of Singapore — $BiFeO_3$ is a multiferroic oxide with perovskite type structure, which has been studied extensively for its ferroelectric and magnetic behavior. The magnetoelectric coupling could potentially provide new functionalities. We have studied the electronic and optical properties of Rhombohedral $BiFeO_3$, which we show to be a very promising candidate material to build active nanophotonic devices, in particular nanoplasmonic devices. It has a strong switching modulated optical properties and a large optical birefringence Δn arising from the combination of octahedral tilts, ferroelectricity and G-type antiferromagnetism in $BiFeO_3$. A prototype of a plasmonic resonator with a Rhombohedral $BiFeO_3$ thin film layer is used as an example and shows excellent switch and modulation responses. The proposed approach provides potential opportunities to develop high performance nanophotonic devices for optical communication. We find excellent switching and modulation responses. The use of Rhombohedral $BiFeO_3$ provides an effective way to actively control optical performance of plasmonic nanostructures.

[1]This work was supported by IHPC, A*STAR under grant A*STAR-SERC 0921540098. Work at ORNL was supported by the Department of Energy, Basic Energy Sciences, Materials Sciences and Engineering Division.

Phuong-Khuong Ong
Institute of High Performance Computing, A-STAR

Date submitted: 06 Nov 2012 Electronic form version 1.4