



Séminaire Invité

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Lundi 11 juillet 2016 – 10h30
Salle de réunion LMS (salle 10-26)



Ultrafast Anisotropic Optical Response and Coherent Acoustic Phonon Generation in $\text{BaTiO}_3\text{-BiFeO}_3$

Multiferroic materials which can exhibit simultaneous ferroelectric and ferromagnetic orders open the door for new devices, for example: non-volatile memory where the magnetization is controlled by an applied electric field [1]. Before we can design these devices we first must characterize the fundamental physics of these materials. Ultrafast optical spectroscopy can provide insight into fundamental microscopic interactions, dynamics and the coupling of several degrees of freedom. Pump/probe studies can reveal the answer to questions like "What are the achievable switching speeds in multiferroics?" Our choice of multiferroic material is a mixture of 27.5% BaTiO_3 (BTO) and 72.5% BiFeO_3 (BFO) which has high Neel and Curie temperatures as well as an improved resistivity and increased magnetoelectric properties in comparison to BFO [2].

In this talk, we compare the transient optical dynamics, acoustic phonons, and near field SHG in polycrystalline samples with epitaxial samples and epitaxial samples with a top layer of ZnO. We report on recent two color (400/800nm) pump-probe time resolved measurements of the reflectivity and birefringence of $\text{BiFeO}_3\text{-BaTiO}_3$ (BTO-BFO) based structures in addition to near field measurements of the second harmonic generation (SHG) in these systems [3,4]. In our samples, we observe a strong sensitivity to pump/probe polarizations dynamics, photo-induced ferroelectric poling on a picosecond timescale, as well as the generation of photo-induced coherent acoustic phonons with a frequency in the range of GHz.

Acknowledgment: This work has been supported by AFOSR through grant FA9550-14-1-0376 and the Institute for Critical Technology and Applied Science (ICTAS) at Virginia Tech.

References

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