Physics Colloquium

Michigan Technological University

Thursday, February 24, 2011, 4:00 pm

Room 139, Fisher Hall

Magneto-photonic Crystal Optical Sensors

Neluka K. Dissanayake

Advisor: Dr. Miguel Levy

Abstract: In this study we present an optical sensor based on refractive index detection utilizing Faraday-effect-active photonic band gap structures fabricated in iron garnet films. It is shown that magneto-photonic-crystal-enhanced polarization effects provide an interesting alternative platform to existing sensor techniques. Strong near-band gap-edge polarization rotations serve as a sensitive probe to cover-index changes in birefringent magneto-optic waveguide photonic crystals. The one dimensional waveguide photonic crystals are fabricated on single-layer bismuth-substituted rare earth iron garnet films grown by liquid phase epitaxy on gadolinium gallium garnet (GGG) substrates. The polarization rotation of the output light from the photonic crystal is measured with respect to end-fire fiber coupled TE polarized input light. Experimental findings are verified with a theoretical analysis of Bloch modes polarization states showing that large near stop-band edge rotations are induced by the magneto-photonic crystal. Bloch mode polarization states are found to vary strongly with cover index and to track the changes in experimentally-measured polarization rotations. Experimental results also suggest that the combined effects of geometrical waveguide birefringence and Faraday rotation contribute to the strength of the sensor response.

Laboratory Investigation of Ice Nucleation Catalyzed by Aerosols at the Air/water Interface

Kristopher Bunker

Advisor: Dr. Will Cantrell

Abstract: Ice in clouds interacts with both incoming solar and upwelling terrestrial radiation. Understanding how ice is formed in clouds is a major outstanding challenge in understanding and predicting weather and climate. Of the known ice formation pathways in the atmosphere (homogeneous, deposition, immersion, condensation and contact), the least understood is contact. I will discuss some previous work regarding contact nucleation, our experimental setup and preliminary results.

MichiganTech