STEVENS INSTITUTE of TECHNOLOGY
THE INNOVATION UNIVERSITY

University Seminar Series

Sponsored by Department of Chemical Engineering and Materials Science

Metamaterials and Plasmonics Research at MIT Lincoln Laboratory

Dr. Vladimir Liberman, MIT Lincoln Laboratory

ABSTRACT: The field of plasmonics and optical metamaterials has grown tremendously within the last decade. Metamaterials refer to artificial materials engineered at the nanoscale to have useful properties not normally found in nature. Plasmonics refers to the subset of metamaterials that rely on surface plasmons, which are light-induced coherent electron oscillations at metal/dielectric interfaces. In this seminar, we will describe our activities in the field of optical metamaterials as related to large-scale sensor fabrication, actively tunable filtering devices, and development of novel metrology methods.

Our work encompasses the simulation of metamaterials-based nanophotonic devices, development of nanofabrication processes, and materials and device characterization. While traditional plasmonics relies on devices made with gold and silver, we have been exploring aluminum as an alternative plasmonic material for use in the ultraviolet and blue parts of the wavelength spectrum. Surface plasmon propagation in a variety of aluminum films has been investigated using total internal reflection ellipsometry and correlated to the film nanostructure. Aluminum-based plasmonic nanostructures have been fabricated in a CMOS-compatible cleanroom and their spectral response has been characterized with spectroscopic ellipsometry.

Tunable filters in the infrared part of the spectrum can enable a variety of new acquisition strategies for multispectral imaging. Current approaches, including fixed filters on filter wheels, or Fabry-Perot etalon – based technologies, are bulky and fragile. We have been developing plasmonic devices in the infrared part of the spectrum, based on liquid-crystal-tunable approaches. We will describe our extensive simulation efforts and experimental results in this area.

BIOGRAPHY: Dr. Vladimir Liberman is a Technical Staff member in the Chemical, Microsystem, and Nanoscale Technologies Group at MIT Lincoln Laboratory. He received the A. B. in Physics from Princeton University in 1986 and his Ph. D. in Applied Physics from Columbia University in 1991. He then held a postdoctoral position at the UC Santa Barbara's center for Quantized Electronic Structures (QUEST). At MIT Lincoln Laboratory he has worked on lifetime testing and evaluation of optics for advanced lithographic application as well as optical characterization of nanomaterials. Most recently, he has been involved, both computationally and experimentally, with a wide variety of metamaterials-related projects for sensing, light shaping and energy-harvesting applications. He has co-authored 2 book chapters and over 100 papers in conference proceedings and refereed publications

EVENT DETAILS

DATE:
Friday, October 31, 2014

TIME:
2:45-3:45pm

LOCATION:
McLean 218A
Stevens Institute of Technology

ATTENDANCE:
This event is open to Stevens' Faculty, Students, Staff, and Invited Guests