Yale Institute for Nanoscience and Quantum Engineering

Friday- October 31, 2014

12:00 to 1:00 p.m.

BECTON SEMINAR ROOM

Light lunch will be served at 11:45 a.m.

Heedeuk Shin

Department of Applied Physics, Yale University

"New signal processing schemes based on photonic-phononic emitter-receivers in silicon"

Recent investigations of the photon-phonon interactions in micro- and nano-scale systems initiate new ways of signal processing with greatly enhanced performance to the unprecedented degree. In this talk, I will discuss optical forces and recent achievements in optomechanics in micro- and nano-scale systems. I will present our recent first-ever demonstration of the photonic-phononic emitter-receiver (PPER) system in multi-port silicon Brillouin-active membrane waveguides. The PPER system shows the second-order filtering responses, promising practical applications in optical RF signal processing with unprecedented frequency selectivity and performances. The controllable photon-phonon interaction in our systems could provide a host of new optical signal processing technologies.

Jon Singer

Department of Electrical Engineering, Yale University

"Multiscale Patterning of Metallic Glasses through Sacrificial ZnO Templates"

Bulk metallic glasses (BMGs) have been advanced as a means to achieve multiscale, nanotextured metallic surfaces, due their ability to be thermoplastically formed on various lengthscales into arbitrarily shaped molds by compression or blow molding. The ability to generate such multiscale structures has allowed for BMG surfaces possessing desirable properties for a multitude of applications, including high surface-area electrochemical electrodes, fuel cells, controlled-wetting surfaces, and cellular response-manipulating patterns. The common synthesis method for such patterns relies on lithographically defined silicon or anodized aluminum oxide (AAO) molds. However, even though effective for proof of concept and scientific exploration, AAO molds are expensive, not scalable, and, most importantly, limited to planar surfaces. In order to realize the proven effectiveness of such BMG patterns in applications, a more economic and versatile synthesis process is required. We have developed a generalized method of sacrificial-template imprint of multiscale structures using ZnO nanostructures. It is established that such structures can be grown cheaply and quickly with tunable morphologies on a wide variety of substrates out of solution. In this way, we achieve metallic structures simultaneously demonstrating features from the macroscale down to the nanoscale requiring only macro/microstructured molds and further possessing tunable optical and wetting properties. This is a critical first step in the use of nanotextured BMG surfaces in industrial, medical, and even consumer applications.

HOST: Paul Fleury