

Public Abstract

First Name:Charles

Middle Name:M

Last Name:Darr

Adviser's First Name:Shubhra

Adviser's Last Name:Gangopadhyay

Co-Adviser's First Name:Luis

Co-Adviser's Last Name:Polo-Parada

Graduation Term:FS 2014

Department:Biological Engineering

Degree:PhD

Title:PLASMONIC-ENHANCED FLUORESCENT CONJUGATED POLYMER CHEMOSENSOR FOR ULTRA-SENSITIVE DETECTION OF NITROAROMATIC VAPORS

Increasing chemical/biological sensor sensitivity and selectivity is of paramount importance to public safety, rapid disease detection, and monitoring of environmental quality. This dissertation reports the use of a nanoscale plasmonic metallic grating to significantly enhance a fluorescent polymer (MEH-PPV) that shows sensitivity to nitroaromatic explosives (i.e. TNT, DNT). Gratings were made by inexpensive nanoimprint lithography (stamping) process and coated with silver. A thin MEH-PPV layer was spin-coated onto the gratings and capped with an ultra-thin (5 nm) protective silica layer to prevent polymer bleaching on exposure to light. The resulting capped MEH-PPV/silver grating sensor system showed 7-fold faster sensor response to DNT vapor than MEH-PPV films on glass and the MEH-PPV was protected from photobleaching for several months. This same sensor setup (grating, polymer, and cap) could be extended to polymers or materials with sensitivity to different targets, with the potential to improve a number of chemical/biological sensors.