Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Photonic-Plasmonic Coupling and Near Field Engineering in Nanoparticle Necklaces ALYSSA PASQUALE, Boston University Electrical and Computer Engineering Department, BJÖRN REINHARD, Boston University Chemistry Department, LUCA DAL NEGRO, Boston University Electrical and Computer Engineering Department — Particle clusters with different degrees of rotational symmetry consisting of circular loops of gold nanoparticles, dubbed nanoplasmonic necklaces, are proposed as a novel, reproducible platform for elastic and inelastic optical sensors with polarization insensitive behavior. Engineering of the necklaces allows for full control of the plasmonic hot-spot locations and near-field strength by coupling photonic resonances to the circular resonator structure. The polarization insensitivity of necklaces guarantees that the plasmonic hot-spots remain excited within the necklaces irrespective of the incident polarization of the excitation field, which is a significant advantage compared to hot-spots in dimer configurations. Near-fields can be further enhanced using radiative coupling in concentric necklaces having integer multiple diameters. Engineering design rules are determined for hot-spot formation, polarization insensitivity, and intensity distribution in necklaces using 3-dimensional Finite-Difference Time-Domain simulations. Plasmonic necklaces of different rotational axes were fabricated using electron-beam lithography and electron-beam deposition of gold films. Surface enhanced Raman scattering measurements were used to experimentally validate our near-field calculations.

Alyssa Pasquale
Boston University Electrical and Computer Engineering Department

Date submitted: 10 Nov 2011 Electronic form version 1.4