Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Tuning the charge transfer plasmon in a metallic nanoparticle dimer bridged by a quantum dot[1] VIKRAM KULKARNI, ALEJANDRO MANJAVACAS, PETER NORDLANDER, Rice University — Localized surface plasmon resonances (LSPR) are a subject of intense experimental and theoretical research interest. LSPR have found applications in catalysis, solar energy, cancer therapy, and surface enhanced Raman spectroscopy (SERS). This is due to the exceptional light capturing and focusing capabilities of plasmonic nanostructures. An LSPR of particular interest is the charge transfer plasmon (CTP). This mode may be excited when two plasmonic nanoparticles are bridged by a conductive junction. The CTP is extraordinarily sensitive to the conductive properties of the junction. Here we perform a theoretical investigation of the CTP when two plasmonic nanoparticles are bridged by a quantum dot. All simulations are done using the time dependent density functional theory (TDDFT). By modulating the electronic structure of the quantum dot we are able to effectively turn the CTP on and off. Specifically, the CTP emerges only when a quantum dot energy level is resonant with the fermi energy of the plasmonic nanoparticles. We verify that the conductance through the junction is on the order of the quantum unit of conductance. This work is of great interest to the future design of plasmonic and molecular electronic systems.

[1]This work was supported in part by the Data Analysis and Visualization Cyberinfrastructure funded by NSF under grant OCI-0959097.

Vikram Kulkarni
Rice University

Date submitted: 22 Sep 2014 Electronic form version 1.4