Abstract Submitted
for the SES13 Meeting of
The American Physical Society

Active Modulation of Plamon-Induced Transparency in Gold:VO_2 Hybrid Nanostructures CHRISTINA MCGAHAN, KANNATASSEN APPAVOO, ETHAN SHAPERA, RICHARD HAGLUND, Vanderbilt University — Plasmon-induced transparency (PIT) is a classical analogue of electromagnetically induced transparency where a spectrally broad and a spectrally narrow plasmon resonance interact. This interaction can yield a sharp, narrow increase in transmission referred to as a transparency window. Here we demonstrate a novel method of reversibly and actively modulating the plasmon resonance of multi-element plasmonic nanostructures which exhibits PIT by using the phase transition in vanadium dioxide. Vanadium dioxide (VO_2) modulates the near-field dielectric environment of metal nanostructures via its semiconductor-to-metal transition (SMT). The SMT shifts the plasmonic response of the metal nanostructure. We design these hybrid structures using three-dimensional, finite-difference time-domain (FDTD) simulations and fabricate them with a combination of high-resolution electron-beam lithography and VO_2 deposition. To measure the modulation, we use IR spectroscopy and observe the spectral change in the location of the PIT window as we heat the VO_2 to thermally induce the phase transition. As the SMT can also be induced optically, these hybrid structures could be useful nanoscale switches or sensors.

Christina McGahan
Vanderbilt Univ

Date submitted: 20 Sep 2013 Electronic form version 1.4