Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Plasmon coupling between distance-controlled gold nanoparticles[1] HOLGER LANGE, Deptartment of Physics, Columbia University, BEATRIZ HERNANDEZ JUAREZ, IMDEA Nanoscience, Madrid, CHRISTIAN THOMSEN, Institut fuer Festkoerperphysik, TU Berlin, TONY F. HEINZ, Deptartment of Physics, Columbia University
— For small enough distances of noble metal nanoparticles in a matrix an additional plasmon-coupled mode is known to appear as a collective excitation between the nanoparticles. We show an approach of combining gold nanoparticles that allows to obtain coupled plasmons that can be dynamically changed, allowing systematic studies of the coupling. Poly-(N-isopropylacrylamide) pNIPAM is a polymer that can be used to produce thermo responsive gels, which have a volume phase transition at around 32°C. A ligand exchange on Au nanoparticles allows the attachment of the nanoparticles to pNIPAM spheres. The combined hybrid Au-pNIPAM system shows a plasmon-coupled mode above the pNIPAM's phase transition, additionally to the well-known shift and broadening of the fundamental plasmon peak. This plasmon mode can be switched on and off and modified simply by changing the temperature. We present discrete dipole approximation (DDA) calculations that characterize this resonance as a quadrupole Au plasmon mode, which results from close-to-contact-particles within the statistically distributed nanoparticles in the pNIPAM matrix. The presented approach is generalizable and allows to investigate the interaction between different kinds of metal nanostructures.

[1]DFG individual grant, Max Kade Foundation

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Date submitted: 08 Nov 2012 Electronic form version 1.4