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Plasmon coupling in nanoparticle rings STEPHAN LINK, WEI-SHUN CHANG, LIANE SLAUGHTER, BISHNU KANAL, PRAMIT MANNA, EUGENE ZUBAREV — A surface plasmon is excited when the conduction band electrons of a metal oscillate coherently in phase with incoming excitation light. Plasmons can exist and propagate along structures that are smaller than the diffraction limit of light, the parameter which currently dictates the minimum size of optical interconnects. In addition to exploiting plasmons on continuous structures like thin films and nanowires for waveguiding, arrays of nanoparticles also pose potential for waveguiding. We have characterized the plasmon coupling of self-assembled rings of 40 nm gold nanoparticles functionalized with polystyrene using dark-field scattering microscopy and spectroscopy. Comparing images and spectra from the rings to those of single particles together with correlating images acquired by dark-field and SEM microscopy, we observe redshifted coupled plasmon modes that show a strong polarization dependence. In particular, segments of the ring aligned parallel to the axis of detected polarization display higher order longitudinal plasmon modes, similar to those observed for a long rod.

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