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Optical Spectra of Au Nanoparticle Arrays in Grating Templates on a Silver Mirror EDGAR PALACIOS, AIQING CHEN, RYAN MILLER, EUGENE DEPRINCE III, STEPHEN GRAY, ELENA SHEVCHENKO, ULRICH WELP, VITALII VLASKO-VLASOV, Argonne National Laboratory — Reflection spectra of close packed spherical gold nanoparticle assemblies in grating templates on a silver film covered with a thin dielectric spacer are studied in a wide range of incidence angles. Wide spectral minina corresponding to the plasmonic eigenmodes of the nanoparticle arrays are observed and compared with spectra of empty gratings. These minima correspond to extended optical bands of the arrays formed due to the strong interactions between localized plasmons modes of nanoparticles, silver film surface plasmons and grating resonances. From the angular variations of the spectra we obtain the dispersion of plasmonic excitations which yield a strong amplificatin of the light intensity in our system. Raman signal enhancement for Benzenethiol molecules in the gaps between nanoparticles is estimated as $3x10^{10}$. The intense light amplification in a wide spectral range and the large number of regular hot spots makes our structures an advanced platform for optical sensing, solid state lighting, and solar harvesting technologies.

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