Pronounced Effects of Anisotropy on Plasmonic Properties of Nanorings Fabricated by Electron Beam Lithography

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Gold nanoring dimers were fabricated via Electron Beam Lithography. The coupling between the inner and outer surfaces of a single nanoring renders it very sensitive to any anisotropy. The nanorings demonstrate exceptional sensitivity to asymmetries in particle shape and high index substrate effects. This results in a Fano lineshape for the dipolar plasmon resonance bands. The traditional file preparation methods for theoretical modeling are unable to accurately represent this slight anisotropy. Accordingly, a method was developed for preparing the files describing the nanoparticle shape for theoretical calculations wherein an SEM image of the particle(s) is directly used to create the file. This method is easy to execute and should therefore become the new paradigm for particle shape descriptions in future calculations. The improved sensitivity of these nanorings due to their geometry and increased field enhancement in the cavity make them attractive for absorption or fluorescence enhancement applications in the future.