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The effects of nanoparticle spacing on second-harmonic generation from gold nano-dimers[1] DAVON W. FERRARA, KEVIN A. TETZ, MATTHEW D. MCMAHON, RICHARD F. HAGLUND, JR., Vanderbilt University
— Second-harmonic generation (SHG) is an important signature of electron dynamics in nanoparticles (NPs) as well as a sensitive probe of surface effects. In the gap between closely spaced pairs of NPs, or nanodimers (NDs), localized electromagnetic field energy creates a hot spot that has been shown to affect SHG from asymmetric NDs. We will present new experimental results demonstrating the role that gap size and field localization plays in SHG from centrosymmetric arrays of gold NDs. Using standard electron-beam lithography techniques, NPs were made 20 nm in height with varying areal aspect ratios. In the ND arrays, symmetry forbids SHG in the forward direction, but not at larger angles. Our experiments indicate suppression in SHG intensity with decreasing gap size and evidence of stronger long range interactions between NPs with separation over 200 nm. Finite-difference time-domain simulations were also performed in order to correlate field localization with SHG. Our simulations show a strong dependence on the polarization of incident light.

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