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Electric-Field-Induced Second-Harmonic Generation in Serrated Nanogap Arrays[1] ANNA YANCHENKO, Univ of Virginia, RODERICK DAVIDSON II, JED ZIEGLER, ROBERT MARVEL, SERGEY AVANESYAN, RICHARD HAGLUND JR., Vanderbilt University — Asymmetric plasmonic nanoparticles can be used to generate and control the spatial distribution of electric fields at the nanoscale in order to efficiently generate second-harmonic light and control its polarization response. Electric-field-induced second-harmonic generation (EFISH) allows for the optical modulation of second-harmonic light using an external, applied electric field. In our experiments, we fabricated novel asymmetric gold nanogaps and demonstrated that they produced second-harmonic light with a conversion efficiency on the order of 10^{-11}. Three plasmonic geometries were fabricated to create unique electric field gradients on a length scale of the order of 100nm. Finite-difference time-domain (FDTD) simulations and experimental extinction spectra of the nanogaps were performed, and the nanogaps were found to have broad plasmonic resonances at 800nm. The plasmons were excited with a horizontally polarized ultrafast Ti:Sapphire laser at 800nm. PMMA was then deposited into the nanogaps, and we found that the PMMA red-shifted the plasmon resonance and reduced the SHG conversion efficiency due to absorption by the PMMA. Future experiments are planned with additional centrosymmetric, non-centrosymmetric and ferroelectric materials.

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