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Surface Energy Density Enhancement in Coupled Gold Nano-Antennae ENZ Materials ANNA SHELTON, MARIAMA REBELLO SOUSA DIAS, University of Richmond — Epsilon Near Zero (ENZ) materials show promise in nonlinear optics due to their ability to confine high levels of energy along their surfaces at the point that the real part of their permittivity crosses zero. However, to observe such effects, bare ENZ thin films require a higher power light source. By coupling the localized surface plasmon polariton (LSPP) of gold nano-antennae onto the surface of ENZ materials, the incident light enhances the electric field in its vicinity, resulting in higher surface energy density. In this work, we simulated six different ENZ materials both with and without strongly-couple gold nano-antennae around their ENZ regime through the finite-difference time-domain (FDTD) method. We find that by coupling tuned gold nano-antennae onto the surface of the ENZ materials, the surface energy density increases more than two order of magnitude of the incident light. As a comparison, bare ENZ materials exhibits enhancement of less than 80% of the incident light energy. By enhancing light absorption at the ENZ materials via LSPP, the energy required to observe nonlinear effects is achieved. This makes ENZ metamaterials exceptional candidates to realize theoretical perfect lenses and improve hologram technology.

Anna Shelton
University of Richmond

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