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Parametric Finite-Difference Time-Domain (FDTD) Simulations of Noble Metal Nanostructres for Near-field Microscopy and Metal-Enhanced Upconversion ROBERT ANDERSON, South Dakota School of Mines & Technology, STANLEY MAY, University of South Dakota, STEVE SMITH, South Dakota School of Mines & Technology — Using the finite-difference time-domain (FDTD) method, we performed parametric studies of the maximum field enhancement at the apex of conical noble-metal nanostructures suitable for use as apertureless near-field scanning optical microscopy (a-NSOM) probes, as a function of taper angle, wavelength and radius of curvature of the hemispherical tip. The results map out the configurational resonances inherent to these structures, and their dependence on geometry and frequency. We also apply these methods to predict the properties of noble-metal nano-rods, synthesized by wet chemistry methods, and assess their potential to enhance the upconverted fluorescence of lanthanide-doped glass nanoparticles, with applications for luminescent solar concentrators. We illustrate our use of the FDTD method to systematically explore the modified fields near these noble-metal nanostructures and discuss possible directions for future research in this area.

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