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Spatially-Resolved Upconversion Luminescence in $NaYF_4$:Yb:Er Nanoparticles on Au Nano-Cavity Arrays[1] JON FISHER, AMY HOR, STEVE SMITH, South Dakota Sch Mines & Tech, BO ZHAO, QUOCAHN LUU, P. STANLEY MAY, University of South Dakota — Spectroscopic imaging was used to study the surface plasmon polariton (SPP) enhanced upconversion luminescence of $NaYF_4$:Yb:Er nanoparticles embedded in PMMA, supported on Au Nano-cavity arrays created by electrodeposition and nanosphere lithography. Spatially-resolved upconversion spectra of these samples show a maximal power-dependent enhancement of approximately 3X over similar layers on adjacent smooth Au surfaces under high excitation intensity, and relatively weaker enhancements at lower excitation intensity. Comparisons to wide-field images of the Nano-cavities show enhancement clearly associated with the formation of the nano-cavity arrays. The width and relative position of the statistical distributions of intensities in the spectroscopic images on and off the nano-cavity arrays were analyzed and found to be strongly dependent on the excitation intensity. The presence of the SPP was confirmed by spectrally resolved reflectivity, and the mechanism for luminescence enhancement was investigated by time resolved measurements of the luminescence decay. Reflectivity measurements are compared to finite difference time domain simulations (FDTD).

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