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Influence of Local Field and Particle Plasmon on Fluorescence Enhancement from Spherical Nano-silver Particles[1] SHU-JU TSAI, HUNG-CHIH KAN, SHY-HAUH GUO, DE-HAO TSAI, MICHAEL ZACHARIAH, RAY PHANEUF, University of Maryland — We report on investigation of fluorescence enhancement from silver nano-particles with selected diameters ranging from 50 nm to 320 nm. We measure the fluorescent intensity for two fluorophores, Cy3 and Cy5, coated on silver nano-particles deposited on silicon substrate using excitation source of an Ar ion laser at 514 nm and a HeNe laser at 633nm, respectively. We find that the optimum diameter shifts to a larger value for the larger wavelength fluorophore; this is consistent with the particle plasmon- resonance dependence on particle size. However, we find that while the fluorescence enhancement drops sharply for larger particle sizes the extinction coefficient doesn't. To understand this inconsistency, we perform numerical calculation with the discrete dipole approximation (DDA) method to calculate the extinction coefficient and the electric field strength near a single Ag particle on Si substrate. In comparison with measurement, the local field strength near the particle shows a size dependence in qualitative agreement with the fluorescence; the extinction coefficient does not.

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