“Simple Nanoparticle Characterization with a Digital Camera”

Christina M. Sweeney,
Graduate Student, Northwestern University, Evanston, IL

Abstract: Noble metal nanoparticles exhibit tunable optical properties, because they support localized surface plasmons (LSPs). The wavelength range and intensity of the LSP resonances are determined by particle shape, size, composition, and local dielectric environment, which can result in both near-field (electromagnetic field enhancement) and far-field (absorption and scattering) effects. Particles with large geometries (>100 nm) and anisotropic features have larger scattering contributions and thus can be used in dark-field imaging as scattering tags. Imaging with plasmonic particles can be a challenge, however, because identifying multiple particle shapes simultaneously is difficult without resorting to time-intensive single-particle spectroscopy. To address this limitation, we have developed a far-field technique which employs a digital camera as a cheap spectrometer capable of monitoring the red, green, and blue channel components of hundreds of single scatterers in a wide-field of view. We have demonstrated that the 3-channel spectrometer can identify the orientation and composition of pyramidal nanoparticles from a single-image and that we can approximate the shape of certain polarization-sensitive particles, such as nanostars or rods, with a set of images taken with polarized illumination.

Speaker's Biography: Christina M. Sweeney received her B.S. in Chemistry from Wayne State University in 2005. She is currently a Ph.D. candidate in Chemistry at Northwestern University. Her research focuses on the fabrication, design, and characterization of plasmonic nanostructures for biological applications and specialized AFM probe fabrication.