The University of Texas at San Antonio

UTSA Physics and Astronomy

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Probing charge density and surface chemistry of nanostructured electrodes using single-particle spectro-electrochemistry

A surface plasmon in a metal nanoparticle is the coherent oscillation of the conduction band electrons leading to both absorption and scattering as well as strong local electromagnetic fields. These fundamental properties have been exploited in many different ways, including for example surface enhanced spectroscopy and sensing, photothermal cancer therapy, and color display generation. The performance of plasmonic nanoparticles for a desired application not only depends on the particle size and shape, but is tunable through nanoparticle interactions on different length scales that support near- and far-field coupling. Chemical synthesis and assembly of nanostructures are able to tailor plasmonic properties that are, however, typically broadened by ensemble averaging. Single particle spectroscopy together with correlated imaging is capable of removing heterogeneity in size, shape, and assembly geometry and furthermore allows one to separate absorption and scattering contributions. In this talk I will discuss our recent work on using the surface plasmon resonance to follow as well as initiate electrochemical processes including charging, physio- and chemisorption of analytes and reactants, and redox reactions.

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