

Tip-Enhanced Raman Nano-Imaging and Nano-Spectroscopy of Plasmonic Nanostructures

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Abstract

This talk will highlight the information content in tip-enhanced Raman (TER) spectral images of plasmonic metal nanoparticles, with emphasis on imaging different aspects of local optical fields in the immediate vicinity of the nanostructures. I will start by outlining our previous work which shows that beyond serving as a tool for mere chemical nanoscopy and nano-imaging, TERS can also access molecular charging, chemical transformations, and multipolar Raman scattering. Furthermore, and through TERS maps of plasmonic nanostructures/nanoparticles, we will show that TERS images trace the structures, magnitudes, and even resonances of localized and enhanced optical fields that are operative in the TERS geometry.

With this in mind, we will illustrate how to silence the above-mentioned 'parasitic' effects - including optical rectification, molecular charging, and chemistry - in the quest to advance analytical TERS measurements that simply track the spatial distributions of molecules/material systems, and inevitably, local fields.