

Abstract Submitted
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Design and Construction of a UHV-LT-STM for Tip-Enhanced Optics. D.R. DAUGHTON, D. LEE, N. EZEH, J.A. GUPTA, Department of Physics, The Ohio State University — The combination of optical techniques and scanning tunneling microscopy (STM) provides insight into a diverse set of physical processes including surface chemistry, surface-photon interactions, and spin scattering in semiconductors. We have designed and built a novel, cryogenic temperature, ultrahigh vacuum STM which utilizes a maneuverable high numeric aperture lens in proximity to the tunnel junction. The microscope currently operates at a base temperature of 12.5 K with 10 pm tip stability. Our initial efforts are focused on studies of photo-chemical reactions and chemical identification by tip-enhanced Raman spectroscopy (TERS). Chemically-etched Ag tips are optimized for field enhancement with characterization by scanning electron microscopy and collection of the plasmon emission from the tip. The optical setup for TERS has been tested utilizing the surface-enhanced Raman signal from the laser dye R6G. The field enhancement of metallic nanostructures can be tuned with atomic manipulation for single molecule spectroscopy and near-field microscopy. <http://www.physics.ohio-state.edu/~jgupta>

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