

Abstract Submitted
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A low temperature ultrahigh vacuum scanning tunneling microscope with high-NA optics to probe optical interactions at the atomic scale¹ HAIGANG ZHANG, Argonne National Laboratory, Argonne, IL 60439, JOSEPH SMERDON, University of Central Lancashire, Lancashire, UK, OZGUN SUZER, HGST, a Western Digital Company, San Jose, CA 95135, HEATH KERSELL, Ohio University, Athens, OH 45701, JEFFREY GUEST, Argonne National Laboratory, Argonne, IL 60439 — The optical and photophysical properties of single molecules/atoms, defects, and nanoscale structures at surfaces hinge on structure at the atomic scale. In order to characterize and control this structure and unravel these correlations, we are developing a low temperature (LT) laser-coupled ultrahigh vacuum (UHV) scanning tunneling microscope (LT Laser UHV STM) based on the Pan-style STM scanner with integrated high-numerical-aperture (NA) optics for single particle spectroscopy measurements under the STM tip. Using slip-stick inertial piezo steppers, the sample stage can be coarsely translated in X and Y directions. For optical measurements, high-NA optics behind and above the sample focus laser excitation on and collect photons emitted from the tip-sample junction. The STM is cooled by a liquid helium bath surrounded by a liquid nitrogen jacket for operation near 5 K; two separate ultrahigh vacuum chambers are used for sample preparation and STM measurements, respectively. We will describe our progress in demonstrating this instrument and plans for experiments studying the correlation between structure and optical function in nanoscale systems.

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