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Spatial mapping of surface plasmons in nanoscale Ag islands on graphite using Scanning Probe Energy Loss Spectroscopy KARL BAUER, SHANE MURPHY, LIN TANG, RICHARD PALMER, Nanophysics Research Laboratory, University of Birmingham — A scanning STM tip operated at high voltage can be used to obtain localized spectroscopic information about surfaces via energy loss measurements [1]. In this technique, known as Scanning Probe Energy Loss Spectroscopy (SPELS), the STM tip is used as a localized source of field-emitted electrons, which, upon backscattering from a surface, are analyzed by an energy-dispersive detector to obtain localized energy loss spectra. Characteristic surface excitations such as plasmons and excitons (as well as secondary electrons) can be probed with a spatial resolution below 50 nm and an energy resolution approaching 0.3 eV [2]. We report the development of a new generation SPELS instrument utilizing a 400-Channel detector, allowing sufficiently fast sampling of the energy loss spectra to allow us to obtain 2D spatially-resolved maps of energy loss features in a reasonable timeframe. We demonstrate the new instrument by mapping plasmons in (thermally evaporated) Ag nano-islands on the surface of graphite and illustrate the various mechanisms give rise to the contrast obtained in the energy-resolved maps.
[1] A. Pulisciano, S.J. Park and R. E. Palmer, Appl. Phys. Lett. 93, 213109 (2008).
[2] F. Festy and R. E. Palmer, Appl. Phys. Lett. 85, 5034 (2004).

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