Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

The role of surface states in inelastic electron tunneling into metal surfaces[1] MINGHU PAN, QING LI, PETER MAKSYMOVYCH, Center of Nanophase Materials Sciences, Oak Ridge National Laboratory, TN, USA 37831 — Inelastic electron tunneling spectroscopy is a highly capable technique to explore dynamic properties of material surfaces, particularly the phonon spectrum. Presently, many of the so-called "propensity" rules that determine the strength of the measured inelastic loss in STM experiments are still unknown or controversial. We have carried out systematic IETS of surface phonons on a Au(111) surface, and spatially-resolved variations in the vibrational spectrum of an adsorbate on the STM tip. In both cases, the IETS intensity markedly dropped at the step edges. At the same time, the IETS intensity exhibits long-range oscillations, the wavelength of which coincided with the Friedel oscillations of the surface state in the vicinity of the defects. All the observations combined, attest to the important role of the surface state in electron-phonon coupling. We will rationalize the observed effects by invoking the symmetry of the tunneling states, with particular emphasis on the effect of the projected band-gap of the gold surface.

[1]This research was conducted at the Center for Nanophase Materials Sciences (CNMS), which is sponsored at Oak Ridge National Laboratory by the Office of Basic Energy Sciences, U.S. Department of Energy.

Minghu Pan
Center of Nanophase Materials Sciences,
Oak Ridge National Laboratory, TN, USA 37831

Date submitted: 28 Nov 2011 Electronic form version 1.4