O 38: Invited Talk Williams

Time: Wednesday 14:45–15:30 Location: H36

Invited Talk O 38.1 Wed 14:45 H36

Fluctuations of nanoscale structures — •Ellen Williams[1], Chenggang Tao[1], William Cullen[1], Timothy Stasevich[1], Theodore Einstein[1], Alexander Bondarchuk[1], Timothy Bole[2], and Philip Rous[2] — [1]MRSEC, U. of Maryland, College Park, MD 20742, USA — [2]Dept. of Physics, UMBC, Baltimore, MD 21250 USA

Thermal fluctuations at electrical contacts in nano- electronic devices will couple to the electrical signal via changes in the local resistivy and electron transmission probabilities. A physical model for such fluctuations is presented by single-layer height steps on surfaces. Temporal variations in step position and and shape have been directly measured on Ag(111) thin films, using STM, as a function of temperature, adhesion of C60 and application of electrical current stress. The time constants and length-scales of the fluctuations, determined from the temporal correlations functions, yield the surprising result that C60 chain-formation along the step edge causes no measurable change in the motion of the Ag atoms along the underlying step. In addition, the signatures of the C60 chain and the Ag step fluctuations are qualitatively different, and occur at different frequencies, in the range of 0.5 to 80 Hz and 0.005 to 0.05 Hz respectively. The coupling of the structural fluctuations to direct current through the sample changes the shape of the correlation function. The results indicate that charge carriers exert average force per diffusing step-edge atom at least an order of magnitude larger than the expected force on freely diffusing surface adatoms. The correlated changes in the surface resisitivity should carry frequency signatures similar to those of the structural fluctuations.