Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Real-Time X-ray Studies of Si Surface Morphology Evolution during Ar+ Ion Bombardment GOZDE OZAYDIN, AHMET OZCAN, YIYI WANG, KARL LUDWIG, Boston University, RANDALL HEADRICK, HUA ZHOU, University of Vermont — A systematic study of Si surface evolution during normal- incidence Ar+ ion bombardment is reported. Real-time grazing incidence small- angle x-ray scattering (GISAXS) measurements were performed at the National Synchrotron Light Source of Brookhaven National Laboratory. *Ex- situ* atomic force microscopy was also used to provide real-space information. Si (100) samples were bombarded at ion energies ranging from 300 to 1000 eV. For normal-incidence sputtering at room temperature, the development of correlated structures with two different characteristic length scales was observed. The shorter length scale features ("dot-like structures") coarsened with time but approached a limiting value of 25-40 nm at all energies examined. These correlations eventually saturate. The surface roughness development then becomes dominated by the growth of the larger length-scale corrugations, causing kinetic roughening. To study the temperature dependence of the surface evolution, Si (100) samples were bombarded with 500 eV ions at temperatures ranging from 25 – 700 C. There is a transition with increasing temperature from an amorphized surface to a crystalline surface. At high temperatures, the nanoscale correlations coarsen rapidly and are significantly longer in wavelength than the "dot" correlations observed at lower sputter erosion temperatures. No saturation is observed during the time of observation. This work is supported by NSF-DMR and DOE-BES. .

Gozde Ozaydin
Boston University

Date submitted: 06 Dec 2004 Electronic form version 1.4