Abstract Submitted
for the NEF05 Meeting of
The American Physical Society

Ion-enhanced Viscous Flow Mediated Ripples on Sapphire Surface HUA ZHOU, YIPING WANG, LAN ZHOU, RANDALL L. HEADRICK, Physics Department, University of Vermont, AHMET S. ÖZCAN, YIYI WANG, GÖZDE ÖZAYDIN, KARL F. LUDWIG, JR., Physics Department, Boston University, D. PETER SIDDONS, National Synchrotron Light Source, Brookhaven National Laboratory — In this work, a study of ripple formation on sapphire surface by ion sputtering is carried out to investigate surface roughing mechanism of energetic ion bombardment, and ion irradiation induced surface relaxation mechanism. Well-ordered surface pattern formation through a surface instability induced self-organization process provides great application potentials in magnetic media for information storage, and quantum wires/dots for electronics and photo-electronic devices. Surface characterization by in-*situ* synchrotron grazing incidence small angle x-ray scattering (GISAXS), off-specular x-ray diffuse scattering (XDS) and ex-*situ* atomic force microscopy (AFM) indicates that the characteristics (wavelength, shape and amplitude) of sapphire ripples can be varied over two orders of magnitudes (30nm to 2000nm) by changing the ion incidence angle, ion energy and temperature. Within the linear Bradley-Harper (B-H) theory regime, the ion induced viscous flow (IVF) fits the general trends of the data. However, anomalous smoothing unpredicted by current models is observed near normal incidence. A relation of the smoothing characteristic time (τ) versus ion energy is extracted to better understand this deviation.

Hua Zhou
Physics Department, University of Vermont

Date submitted: 29 Sep 2005 Electronic form version 1.4