Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Humidity influence on atomic force microscopy electrostatic nanolithography SERGEI LYUKSYUTOV, The University of Akron, OH, SHANE JUHL, RICHARD VAIA, AF Research Laboratory, WPAFB OH — The formation and sustainability of water menisci and bridges between solid dielectric surface and nano-asperity under external electrostatic potential is a mystery, which must be adequately explained. The goal of our study is twofold: (i) To address the influence of an ambient humidity through the water meniscus formation on the nanostructure formation in soften polymeric surfaces; (ii) Estimate an electric charge generation and transport inside the water meniscus in vicinity of nanoscale asperity taking into consideration an induced water ionization in strong non-uniform electric field of magnitude up to 10^{10} Vm^{-1}. It is suspected that strong electric field inside a polymer matrix activates the hoping mechanism of conductivity. The electrons are supplied by tunneling of conductive tip, and also through water ionization. Electric current associated with these free carriers produces Jule heating of a small volume of polymer film heating it above the glass transition temperature. Nanostructures are created by mass transport of visco-elastic polymer melt enabling high structure densities on polymer film.

Sergei Lyuksyutov
The University of Akron

Date submitted: 21 Nov 2005 Electronic form version 1.4