

MAR05-2004-001332

Abstract for an Invited Paper
for the MAR05 Meeting of
the American Physical Society

Scaling down polymer thermomechanics for data storage applications

BERND GOTSMANN, IBM Zurich Research Laboratory

The Atomic Force Microscopy based data storage concept [1], called the “Millipede,” involves making indents in a thin polymer film using heated cantilever/tips. Using this technique, high areal storage density and a good data rate in a small form factor can be achieved. The underlying technical and scientific questions are related to polymer mobility at small dimensions and various time-scales: First, polymer indentation has to be regarded in a 3D confinement of nanometer size, at time scales down to and below one microsecond and under extreme shear and compressive stresses. The kinetics is found to be a key in understanding the indentation mechanism. Second, for the ‘reverse’ indentation process, both small time scales (in microseconds during erasing) and large time scales (up to 10 years for data lifetime) matter. Finally, tribology issues, in particular polymer wear on nm scale, have to be considered. Experiments are presented shedding light onto the polymer physics related to most of these questions. Some of the technical solutions as well as open questions are addressed. [1] P. Vettiger et al., IEEE Trans. Nanotechnology, 1(1), 39- 55, 2002