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Polymer dynamics at local scales: origin of ripples formation
ROBERT SZOSZKIEWICZ, School of Physics, Georgia Institute of Technology, Atlanta, GA 30332, TAKASHI OKADA, School of Chemistry and Biochemistry, Georgia Institute of Technology, Atlanta, GA 30332, ENRICO GNECCO, Institute of Physics, University of Basel, Switzerland, WILLIAM KING, School of Mechanical Engineering, Georgia Institute of Technology, Atlanta, GA 30332, SETH MARDER, School of Chemistry and Biochemistry, Georgia Institute of Technology, Atlanta, GA 30332, ELISA RIEDO, School of Physics, Georgia Institute of Technology, Atlanta, GA 30332 — A plethora of nanowear patterns in polymers has been obtained by heating the polymers and scanning their surfaces with an atomic force microscope (AFM) tip (1, 2). These morphologies represent the nanoscale realization of aeolian ripples in sandy deserts and are similar to patterns obtained during evolution of surfaces during ion sputtering (3). By means of locally heated AFM probes we studied ripples on various polymer films. While the theory of aeolian ripples formation is very complicated (3), we show that the key morphological features in our results can be explained in terms of the elastic and diffusive properties of the polymer. From measurements of the ripple spacing we study the local dynamics of polymers in the vicinity to the glass transition. (1) B. Gotsmann and U. Durig, Langmuir 20, 1495 (2004) (2) R. H. Schmidt, G. Haugstad and W. L. Gladfelter, Langmuir 15, 317 (1999) (3) T. Aste and U. Valbusa, New Journal of Physics 7, 122 (2005).

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