

Abstract Submitted
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Nanomechanical Measurements on Ultra-thin Polymer Films

SHANHONG XU, PAUL OCONNELL, GREG MCKENNA, Texas Tech University — A novel experimental technique for measuring the viscoelastic properties of ultrathin polymer films is described. The method is a scaled down version of the classic bubble inflation technique for measuring the biaxial creep compliance of films and is capable of measuring the creep compliance response of films at least as thin as 13 nm. Atomic force microscopy is used to image the nano-bubbles as a function of time, temperature and film thickness. The bubble shape (along with the known applied pressure and film thickness) gives the stress and strain in the film, from which the compliance may be calculated. Experiments on a range of polymers are presented and show a universal stiffening of the material in the rubbery regime as the thickness is reduced. This is in contrast to the degree to which the glass transition temperature is reduced which is material specific.

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