

Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Noncontact viscoelastic measurement of polymer thin films in a liquid medium using a long-needle AFM DONGSHI GUAN, Department of Physics, Hong Kong University of Science and Technology, CHLOE BARRAUD, ELISABETH CHARLAIX, LIPHY, Universite Grenoble Alpes, PINGER TONG, Department of Physics, Hong Kong University of Science and Technology — We report noncontact measurement of the viscoelastic property of polymer thin films in a liquid medium using frequency-modulation atomic force microscopy (FM-AFM) with a newly developed long-needle probe. The probe contains a long vertical glass fiber with one end adhered to a cantilever beam and the other end with a sharp tip placed near the liquid-film interface. The nanoscale flow generated by the resonant oscillation of the needle tip provides a precise hydrodynamic force acting on the soft surface of the thin film. By accurately measuring the mechanical response of the thin film, we obtain the elastic and loss moduli of the thin film using the linear response theory of elasto-hydrodynamics. The experiment verifies the theory and demonstrates its applications. The technique can be used to accurately measure the viscoelastic property of soft surfaces, such as those made of polymers, nano-bubbles, live cells and tissues. This work was supported by the Research Grants Council of Hong Kong SAR.

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Date submitted: 08 Nov 2016

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