Abstract Submitted
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Acoustic modes and elastic properties of polymeric nanostructures[1] RYAN D. HARTSCHUH, A. KISLIUK, A.P. SOKOLOV, University of Akron, V. NOVIKOV, U of A and IA&E, Russian Academy of Sciences, P.R. HEYLIGER, Colorado State University, C.M. FLANNERY, W.L. JOHNSON, NIST, Boulder, C.L. SOLES, W.-L. WU, NIST, Gaithersburg — Very few experimental techniques exist to quantify the mechanical properties of nanoscale photoresist structures. This inadequacy is going to become increasingly important as the rigidity of such structures is expected to change as the feature sizes approach the characteristic dimensions of the macromolecules and size-dependent material properties begin to compromise device fabrication and performance. Phonon spectra of polymeric linear nanostructures have been characterized using Brillouin light scattering. In addition to phonon modes similar to those present in uniform thin films, the phonon spectra of the nanolines reveal a new mode with a lower frequency that depends on the width of the nanolines. Classic wave theory and finite element analysis were combined to identify this new mode as a flexural vibration of the nanolines. Analysis of the phonon spectra gave estimates of elastic constants in the nanostructures and indicated that there is no significant deviation from bulk mechanical properties and no mechanical anisotropy in structures as small as 88 nm.

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