Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Adhesion and Release Mechanisms for Nanoimprint Lithography
DOUGLAS HOLMES, University of Massachusetts, Amherst, JOHN WHANG, EDWIN CHAN, University of Massachusetts, Amherst, ALFRED CROSBY, University of Massachusetts, Amherst — Nanoimprint lithography is a leading candidate for fabricating next generation devices with features smaller than 50nm. A fundamental challenge with this emerging technology is the generation of defects during the release of the template from the cured polymer pattern. This release process is dependent not only on the surface energetics of the template and the cured polymer, but also on the local mechanical properties of both materials – similar to the propagation of a crack at an interface. Here we present results on the investigation of adhesion and release properties of several polydimethylsiloxane-based polymer templates using UV-based imprint lithography techniques. We demonstrate that the framework of fracture mechanics and the theory of Johnson, Kendall, and Roberts (JKR) allows the separation of bulk and interfacial contributions to the overall release process. This decoupling of material properties guides the future development of both templates and imprintable resists for the success of nanoimprint lithography.

Douglas Holmes
University of Massachusetts, Amherst

Date submitted: 30 Nov 2005 Electronic form version 1.4