Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Mechanical properties of silicon nanowires studied by polarization-enhanced fiber-optic interferometry[1]

JOHN NICHOL, University of Illinois at Urbana-Champaign, ERIC HEMESATH, LINCOLN LAUHON, Northwestern University, RAFFI BUDAKIAN, University of Illinois at Urbana-Champaign — Silicon nanowires have recently attracted attention as promising force sensors due to their inherent low dissipation and high frequency. One of the principal challenges to the use of nanowires as scanning probe force sensors is displacement detection. By exploiting the polarization anisotropy in light scattering from single nanowires, we have used fiber-optic interferometry to detect the displacement of individual silicon nanowires. We achieve a displacement sensitivity of 0.5 pm/$\sqrt{\text{Hz}}$ for 15 μW of light incident on the nanowire. The nanowires studied have ultralow mechanical dissipation in the range of 2×10^{-15}- 2×10^{-14} kg/s. We also discuss the effects of hydrogen surface passivation on mechanical dissipation. Further progress toward the use of nanowires as scanning probe force sensors is discussed.

[1]This work was supported by the ARO (MURI grant W911NF-05-0414) at the University of Illinois and by the NSF (NIRT program) at Northwestern University.

John Nichol
University of Illinois at Urbana-Champaign

Date submitted: 21 Nov 2008 Electronic form version 1.4