Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Mechanics of Nanoscale Clamps W. DING, L. CALABRI, D.A. DIKIN, X. CHEN, R. D. PINER, E. ZUSSMAN, RODNEY S. RUOFF* TEAM[1], X. WANG, X. LI TEAM[2] — Proper sample clamping is crucial for nanostructure mechanics studies. We pioneered using electron beam induced deposition (EBID) for *in situ* clamp fabrication inside an SEM, and here report the chemical composition, atomic structure, and stiffness and hardness of such clamps as measured by HRTEM, EELS, SIMS, Raman, and nanoindentation. A strong clamp means tensile loading to break without slippage or failure, and achieving, for mechanical resonance testing, the boundary conditions appropriate for simple beam theory. Here we report nanoscale pullout tests on 1-d nanostructures to evaluate EBID clamp strength. Several analytic models were used to analyze the pullout results. FIB sectioning was used to study the 3-d cross section of clamps previously used in tensile loading. FEA was used to study the stress distribution in the clamp. The clamp influence on resonance measurements of cantilevered nanostructures will also be presented. *This work was funded by ONR # N000140210870. Also: E. Z. NSF # 0200797; D. D. and X. C. NSF #0304506 and by the NASA BIMat URETI # NCC-1-02037. X. W. and X. Li: NSF EPS-0296165, the SC Space Grant Consortium-NASA, and USC NanoCenter Seed Grant.*

[1]Mech. Eng, Northwestern Univ.
[2]Mech. Eng, Univ. South Carolina

W. Ding

Date submitted: 02 Dec 2004 Electronic form version 1.4