Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Electrothermal Tuning of Nanomechanical Resonators MICHAEL MANOLIDIS, Columbia University, SEONG CHAN JUN, X.M. HENRY HUANG, J. HONE — A highly effective electrothermal tuning method has been demonstrated for Al-SiC nanomechanical resonators. Doubly clamped beam devices are actuated and read out using a magnetomotive technique under moderate vacuum. DC current applied to a beam heats the structure and shifts the resonance frequency downward. Frequency shifts of 10 percent are easily achievable, and the thermal time constant of these structures is in the μs range. The initial frequency and frequency tunability are studied for beams of varying Al thickness, and the device performance can be accurately modeled using simple mechanical and thermal models. Because of the different mechanical properties of SiC and Al, both the initial frequency and the frequency tunability can be modified by varying the Al layer thickness. This approach has the potential to become an important tool for effective frequency tuning in deployable SiC-based NEMS devices and systems for applications that would benefit from SiC as the structural material.

James Hone
Columbia University

Date submitted: 29 Nov 2005 Electronic form version 1.4