MAR05-2004-004087

Abstract for an Invited Paper
for the MAR05 Meeting of
the American Physical Society

Attogram detection using nanoelectromechanical oscillators

HAROLD CRAIGHEAD, Cornell University

We have used small mechanical oscillators as sensitive detectors of bound mass. Because the devices have very small mass, added mass of less than an attogram produces a readily observed shift in the resonant frequencies. For these experiments arrays of resonant devices of various geometries, made primarily from silicon-based materials, were fabricated by electron beam lithography, photolithography or other techniques. We used optical interference techniques to transduce the structure motion as this provides a simple non-contact method for interrogating arrays of oscillators. Chemically selective coatings were used to make the devices respond to specific chemicals, biomolecules, viruses or bacteria. Localizing the specific binding compounds to a nanoscale dot on the oscillator creates a device with a calibrated response to the binding of a few discrete particles from a small volume sample. In this talk we will describe the design, fabrication, mechanical response and use of these devise as specific mass detectors.