Attogram detection using nanoelectromechanical oscillators

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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.