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Nano-electromechanical structures for single molecule transport studies and position sensing SHAWN TANNER, CHARLES ROGERS, Department of Physics, University of Colorado, Boulder, CO 80309 — We have developed a process for making sub-micron cantilevers, clamped beams, and more complicated electro-mechanical structures that carry integrated electrical leads. Such objects are useful as test structures for measuring the electrical properties of molecular sized objects, as high frequency electromechanical components for radio frequency and microwave applications, and as sensor components for studying fluctuations in small systems. Our process uses two realigned electron beam lithography steps, a thin-film angled deposition system, and differential removal of sacrificial aluminum layers to produce freely suspended sub-micron electro-mechanical components. We have produced cantilevers and beams on a variety of substrates (silica, silicon, and polyimide) and have produced insulating, conductive, and multilayer electro-mechanical structures. The process allows the use of essentially any material that can be deposited from a thermal or electron-beam deposition source. We have constructed mechanically adjustable gold-vacuum-gold contacts and have demonstrated vacuum tunneling. The behavior of these contacts indicates a gold work function in excess of 4 eV, consistent with clean gold surfaces.

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