Abstract Submitted
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Measurement of electronic perturbations in the surface of a carbon nanotube by adsorbed atoms and molecules[1] DAVID COBDEN, BORIS DZYUBENKO, HAO-CHUN LEE, OSCAR VILCHES, University of Washington, Seattle — The physisorption of atoms and molecules onto a surface such as carbon involves small hybridization with the substrate electron states which have not previously been accessible to experiments. Suspended single-walled carbon nanotube devices are a good system for studying the electronic perturbations, as they combine a perfect carbon surface with single-atom mass sensing capability and single-electron-transistor sensitivity. By monitoring both the conductance and the adsorbed mass, derived from the mechanical frequency shift, in equilibrium with the vapor, we are able to detect for the first time the very small charge transfer from adsorbates to the surface. It is found to be of a similar magnitude for all gases tested (4He, Ar, Kr, Xe, N2, CO and O2), and depends on coverage and temperature. Although it is only 10^{-5} – 10^{-3} e per atom, at gate voltages near threshold it can produce a large change in conductance. It can thus be used to sense tiny amounts of adsorbates and to explore the phase transitions of atoms on a cylinder.

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