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Detection of adsorbed monolayers on suspended singlewalled carbon nanotubes. ZENGHUI WANG, JIANG WEI, WEI CHEN, ANDREW JONES, OSCAR VILCHES, DAVID COBDEN, University of Washington — Adsorbates on a suspended single-walled carbon nanotube at a coverage of one monolayer or less offer the opportunity to study the various phases and phase transitions of a system where the dimensionality is below two. This is because such a monolayer resembles a well studied 2D monolayer on planar graphite, but with a tight cylindrical boundary condition imposed. The adsorbed density for any gas can be measured by using the nanotube itself as a vibrating microbalance, whose frequency varies with the adsorbed density and whose amplitude is detected by the way it modulates the conductance. We are focusing on two systems both thoroughly studied before on 2D graphite: the noble gases Xe and Kr; and oxygen. The noble gases are attractive for their simplicity, and because in 2D they exhibit discontinous phase transitions, which are not allowed in 1D according to an argument of Landau. They thus allow the possibility to confirm and explore this basic prediction of statistical mechanics for the first time. The magnetic and steric properties of phases of oxygen on 2D graphite, together with the question of its apparently unexplained large doping effect on nanotubes, make it particularly interesting and important. We have made suitable nanotube devices and will report on our progress in detecting monolayers on them.

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