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Conductance isotherms for adsorption of noble gases on individual single-walled carbon nanotubes[1] BORIS DZYUBENKO, HAO-CHUN LEE, OSCAR VILCHES, DAVID COBDEN, University of Washington — Using transistors made from suspended carbon nanotubes allows one to probe the interaction of adsorbed atoms and molecules with the carbon substrate electrons. We have studied the effects of adsorbing He, Ne, Ar, Kr, Xe, and other gases on the electrical properties of individual suspended single-walled nanotubes, as a function of pressure and temperature. The conductance changes measurably, and sometimes dramatically, as a monolayer forms and undergoes phase transitions. It yields complementary information to the coverage, which is obtained from the mass shift in the natural vibrational frequency of the nanotube. For example, measurements below the 2D critical point show nonmonotonic features and fluctuations heralding the first-order phase transition. Conductance changes can be measured on a timescale of milliseconds, permitting studies of the dynamics of the monolayer. In the nonlinear regime we observe features in the I-V characteristics as phase transitions are induced by the current and nonequilibrium stationary states occur.

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