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Adsorption of noble gases on individual suspended single-walled carbon nanotubes HAO-CHUN LEE, ZENGHUI WANG[1], RICHARD ROY, ERIK FREDRICKSON, OSCAR VILCHES, DAVID COBDEN, Department of Physics, University of Washington — Suspended single-walled carbon nanotubes can act as nanomechanical resonators, offering the ability to detect an adsorbed substance with very high sensitivity via the frequency shift due to the adsorbed mass. By measuring the resonance frequency electrically in the presence of vapors at controlled temperature and pressure we have obtained isotherms for 4He, Ar, Kr and Xe, on multiple nanotubes. The behavior resembles that on graphite but with notable differences, including weaker binding energies. The lower binding allows access to behavior at lower 2D chemical potential than on conventional substrates. For 4He the binding energy is reduced by as much as a factor of two. For Ar the derived two-dimensional phase diagram is similar to that on conventional substrates. For Kr there is variation between nanotubes which may be related to commensurability and area per site on the surface of a cylinder. Work supported by NSF DMR 0907690.

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