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Argon and Krypton Adsorption Isotherms on Single Carbon Nanotube Devices ZENGHUI WANG, PETER MORSE, JIANG WEI, OSCAR VILCHES, DAVID COBDEN, University of Washington — We have fabricated mass balances each consisting of an individual single-walled carbon nanotube suspended across a micron-sized trench in an oxidized Si wafer. The vibrational resonance frequency of a nanotube, which is in the range 50-500 MHz, is determined by monitoring the current through it while applying an electrostatic driving signal. By tracking changes in the resonance frequency we have measured isotherms of adsorbed mass vs vapor pressure for Ar ot Kr at liquid nitrogen temperatures. The sensitivity of the balances corresponds to just a few atoms. We have compared the monolayer mass shifts due to Ar and Kr, and measured a family of isotherms of Ar below 77 K. From the latter we calculated the isosteric heat of adsorption on the nanotube surface, which is found to be lower than that of Ar on basal plane graphite and only slightly larger than the latent heat of sublimation of bulk Ar at these temperatures. In one device we observed a phase transition in the adsorbed Ar near monolayer completion. In another device, which probably consists of two nanotubes joined in parallel, we observed enhanced adsorption at lower coverages which may be in the groove between the two nanotubes. This work is supported by the NSF, grant number 0606078.

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