

Abstract Submitted
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Measurements of adsorbate binding on individual suspended carbon nanotubes¹ HAO-CHUN LEE, BORIS DZYUBENKO, DAVID COBDEN, OSCAR VILCHES, Department of Physics, University of Washington — By measuring the resonance frequency shift of vibrating suspended single-walled nanotubes at controlled temperature and pressure we can accurately detect the adsorption of gases including He, Ar, Kr, Xe, O₂, and N₂. The binding energy can then be determined from the low-coverage part of the adsorption isotherms. We find that the adsorption isotherms generally resemble those on graphite but with weaker binding energies, allowing access to behavior at lower two-dimensional (2D) chemical potential than on graphite. For He-4 the binding energy is reduced by as much as a factor of two. For Ar the binding energy on all nanotubes measured is in the range 800 - 900 K, about three quarters of that on graphite. This enables us to investigate the 2D critical and triple points of Ar. Puzzlingly, we find that the devices fall into two classes: one with monolayer condensation at lower pressures and sudden 2D liquid-vapor transitions, the other with condensation at higher pressures and lacking sharp transitions even well below the 2D critical point.

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