Abstract Submitted
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Metastability and capillary condensation hysteresis in nearly ideal cylindrical alumina nanopores[1] FELIX CASANOVA, CASEY E. CHIANG, CHANG-PENG LI, IGOR V. ROSHCHIN, Physics Dept., ANNE M. RUMINSKI, MICHAEL J. SAILOR, Dept. Chemistry and Biochemistry, IVAN K. SCHULLER, Physics Dept., University of California San Diego — Nanoporous materials can be used as chemical and biological sensors. Anodized alumina, in which ordered cylindrical nanopores can be tuned in size, is a nearly ideal system to study gas adsorption and capillary condensation occurring in mesopores. Porous alumina with tunable pore diameters in the 10 to 60 nm range and a narrow distribution (<20%) were dosed with several organic vapors. Capillary ***evaporation*** occurs at equilibrium pressure for all pore sizes and gases, as predicted by the Kelvin equation. On the other hand, capillary ***condensation*** occurs within a range of metastability of the gas phase, in agreement with theoretical models. Such a hysteresis in the condensation-evaporation process is a signature of metastability and depends on the gas adsorbed. Isopropanol (with stronger surface interactions) always condenses at the same pressure, whereas for toluene (with weaker interactions), the condensation pressure is less reproducible.

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