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In situ studies of capillary filling in nano-porous alumina[1] KYLE ALVINE, OLEG SHPYRKO, PETER PERSHAN, Harvard University, KYUSOON SHIN, THOMAS RUSSELL, University of Massachusetts, Amherst — Manipulation of matter on nano-scale requires thorough understanding of fundamental properties of materials defined by surface and interfacial phenomena, rather than bulk structure. We report studies of capillary filling in nano-porous alumina with a liquid solvent (perfluoromethyl-cyclohexane) as a function of the offset in chemical potential from liquid-vapor coexistence. Nano-porous alumina samples contains nearly hexagonally ordered, geometrically aligned cylindrical pores of ∼15nm diameter and aspect ratio of 1:4,000. Small-angle x-ray scattering measurements make it possible to observe formation of nano-scale wetting film at pore walls and to characterize the film thickness as the chemical potential is varied. Our data indicates a gradual thickening of a liquid film thickness on the capillary walls followed by a nearly discontinuous jump as pores get entirely filled.

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