

Abstract Submitted
for the OSS13 Meeting of
The American Physical Society

Deformation of mesoporous silica by capillary pressure: an X-ray scattering study¹ MAYUR SUNDARARAJAN, GANG CHEN, Ohio University — Capillary pressure originates from surface tension between two immiscible interfaces. In the case of water confined in nanosized pores (i.e. mesopores), the capillary pressure becomes so enormous that it easily deforms solid scaffold of the mesoporous materials. We developed a combined small and wide angle x-ray scattering(S/WAXS) technique to study the deformation of prototypical mesoporous silica (i.e., MCM-41) induced by in situ capillary condensation. The capillary strain on the silica scaffold was measured as a function of relative humidity, from which the mechanical properties such as Young's modulus and Poisson's ratio of the mesoporous silica were analyzed. The measurements performed on two samples with different thermal history reveal that thermal annealing has significant impact on the mechanical properties of the mesoporous material. Our study demonstrates a novel X-ray-based technique for analyzing mechanical properties of mesoporous materials.

¹NSF DMR No.0906825

Mayur Sundararajan
Ohio University

Date submitted: 28 Feb 2013

Electronic form version 1.4