Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Solvent mediated assembly of Nanoparticles confined in Mesoporous Alumina[1] KYLE ALVINE, DIEGO PONTONI, PETER PERSHAN, Harvard University, OLEG SHPYRKO, Center for Nanoscale Materials, ANL, DAVID COOKSON, Australian Nuclear Science and Technology Organization, KYUSOON SHIN, THOMAS RUSSELL, University of Massachusetts, Amherst, FRANCESCO STELLACCI, Massachusetts Institute of Technology, OLEG GANG, Center for Functional Nanomaterials, BNL — In-situ small angle x-ray scattering measurements of the solvent mediated assembly of 2 nm diameter Au-core colloidal nanoparticles inside mesoporous alumina are presented. The evolution of the self-assembly process was controlled reversibly via solvent condensed from vapor. Measurements of the absorption & desorption of solvent showed strong hysteresis upon thermal cycling. In addition, the capillary transition for the solvent in the nanoparticle-doped pores was shifted to greater under-saturation by a factor of four relative to the expected value for the same system sans nanoparticles. Analysis indicated that a cylindrical shell super-structure of the nanoparticles is maintained throughout the addition and removal of liquid solvent. Nanoparticle nearest-neighbor separation increased and the in-shell order decreased with the addition of solvent. The process was reversible with the removal of liquid. Isotropic clusters of nanoparticles were also observed to form temporarily during desorption of the liquid solvent and disappear upon complete removal of liquid.

[1]This work was supported in part by NSF Grant No. 03-03916

Kyle Alvine
Harvard University

Date submitted: 29 Nov 2005 Electronic form version 1.4