Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Self-Assembly of Nanoporous Silica: Synthesis, Morphogenesis, Functionalization, and Applications YAROSLAV KIEVSKY, IGOR SOKOLOV, Clarkson University — We study the process of self-assembly and growth of nano(meso)porous silica particles and film via surfactant templating. Process of formation of the mesoporous silica includes growth of the liquid crystalline template and solidification of this template via polymerization of silica precursor. Material obtained as a result of such synthesis (e.g., MCM-41) features highly uniform porosity, a large variety of shapes and their sizes. To control the assembly of the desired shapes, we study their morphogenesis. New conditions of self-assembly are found to form monoshaped nanoporous fibers. Recently suggested Origami-type mechanism for synthesizing a rich family of nanoporous silica shapes (cones, hollow tubes, and helixes) is examined. Shape details and their evolution are analyzed by means of XRD, SEM, TEM, AFM, and optical microscopy techniques. The shapes can possibly serve as templates for various electronic and optical applications. Nanoporous shapes are the prospective hosts for lasing dyes (sealing laser dye molecules inside the silica pores saves them from oxidation and prevents their dimerization). Color coded silica beads are interesting for tagging in security applications and labeling in biology. Diffusion from the nanoporous shapes can be used for a control drug release. Another application of mesoporous silica is the coating of optical fibers by uniform low refractive index film with a good adhesion – a possible host for laser dyes or quantum dots.

Yaroslav Kievsky

Date submitted: 29 Nov 2005 Electronic form version 1.4