A NEW ROUTE FOR THE PREPARATION OF MESOPOROUS AND HYBRID NANOMATERIALS THROUGH TEMPLATING OF REVERSE LIQUID CRYSTALS

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We report on the preparation and characterization of mesoporous silica monoliths by a new method based on the use of reverse lyotropic liquid crystals formed in a polydimethylsiloxane-graft-polyoxyethylene (PDMS-PEO) copolymer as templates. The as prepared monoliths are transparent whereas the calcined materials contain a hexagonal array of mesopores (diameter = 40-50 Å) with very thick walls (thickness = 40-50 Å), showing little shrinkage upon calcination. Moreover, they are thermally stable and apparently present low microporosity, which is attributed to the contribution of PDMS chains to the silica network. Since the obtained materials contain hydrophilic nanodomains, silver nanoparticles can be synthesized in situ and in one-step process, without the need of external reducing agents, so that Ag-doped hybrid materials can be obtained. A simple mechanism is proposed for the preparation of these mesoporous materials, which offer new possibilities for interesting applications.

Figure: Silica monolith (left), mesoporous silica (center) and silver/silica hybrid (right) obtained using a PDMS-PEO copolymer as template.