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Highly Loaded Mesoporous Silica/Nanoparticle Composites and Patterned Mesoporous Silica Films ROHIT KOTHARI, Univ. of Massachusetts Amherst, NICHOLAS R. HENDRICKS, Univ. of Massachusetts Amherst, XINYU WANG, JAMES J. WATKINS, Univ. of Massachusetts Amherst — Novel approaches for the preparation of highly filled mesoporous silica/nanoparticle (MS/NP) composites and for the fabrication of patterned MS films are described. The incorporation of iron platinum NPs within the walls of MS is achieved at high NP loadings by doping amphiphilic poly(ethylene oxide-b-propylene oxide-b-ethylene oxide) (Pluronic®) copolymer templates via selective hydrogen bonding between the pre-synthesized NPs and the hydrophilic portion of the block copolymer. The MS is then synthesized by means of phase selective condensation of tetraethylorthosilicate (TEOS) within the NP loaded block copolymer templates dilated with supercritical carbon dioxide ($scCO_2$) followed by calcination. For patterned films, microphase separated block copolymer/small molecule additive blends are patterned using UV-assisted nanoimprint lithography. Infusion and condensation of a TEOS within template films using ScCO2 as a processing medium followed by calcination yields the patterned MS films. Scanning electron microscopy is used characterize pattern fidelity and transmission electron microscopy analysis confirms the presence of the mesopores. Long range order in nanocomposites is confirmed by low angle x-ray diffraction.

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