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Three dimensional mesoporous silica structures with templated macropores ROHIT KOTHARI, NICHOLAS R. HENDRICKS, JAMES J. WATKINS, University of Massachusetts Amherst — A novel approach to fabricate three dimensional macroporous structures comprised of mesoporous silica is demonstrated. Well-ordered mesoporous silica structures with macroporosity were obtained by using humidified supercritical carbon dioxide as a carrier medium to infuse and domain selectively condense silica alkoxide precursor in a microphase separated block copolymer/small molecule additive blend solution casted on macroporous supports such as cellulose filter paper and sponge. Subsequent calcination was used to remove both the block copolymer template and the macroporous support. Transition electron microscopy (TEM) and small angle x-ray diffraction (SAXD) confirmed the presence of well-ordered mesopores. Scanning electron microscopy confirmed faithful replication of the features of the macroporous supports. Physisorption showed BET surface areas as high as 400m²/g and the BJH pore size distributions obtained are in close agreement with the TEM and SAXD results. This dual scale porosity within the silica template will enhance overall transport and diffusion, which is appropriate for many applications including catalysis and sensing.

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