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Novel Route to Mesoporous silica with perpendicular nanochannels from polymer/inorganic nanocomposite films SIVAKUMAR NAGARAJAN, MINGQI LI, RAJARAM PAI, CRAIG WEINMAN, CHRISTOPHER OBER, THOMAS RUSSELL, JAMES WATKINS, UNIVERSITY OF MASSACHUSETTS,AMHERST COLLABORATION, CORNELL UNIVERSITY COLLABORATION — Mesoporous metal oxide films have generated intense interest due to their potential scientific and technological importance. For applications such as sensors, separations and detection devices, structures having cylindrical channels oriented normal to the surface are highly desirable, but have remained elusive. Recently we reported a new approach to mesoporous materials that involves the infusion and selective condensation of metal oxide precursors within one phase domain of a highly ordered, preformed block copolymer template dilated with supercritical carbon dioxide to yield a polymer/inorganic nanocomposite film. The organic component of the nanocomposite is then removed to produce the mesoporous oxide. To date ordered spherical and randomly oriented cylindrical morphologies have been replicated to yield silica/organosilicate mesostructures in films over micron thick while maintaining all the structural details of the sacrificial copolymer template. The preparation of phase-segregated block copolymer films with cylindrical domains oriented normal to the surface using controlled solvent evaporation has recently been realized. Here we report the replication of these templates to yield the corresponding silicate mesostructures containing arrays of perpendicular channels.

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