Mesoporous Solid and Hollow Inorganic Spheres from Multicomponent Polymer Blends

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Mesoporous solid/hollow inorganic spheres are of great importance for a broad range of applications, but their synthesis methods are usually complicated or material specific and lack control over meso/macrostructure. Here we report a facile yet versatile method that combines mesoscale block copolymer (BCP) self-assembly and macroscale spinodal decomposition in multicomponent homopolymer/BCP/inorganic precursor blends. Macrophase-separated homopolymer domains function as *in-situ* generated molds that form BCP directed inorganic precursor domains into spherical particle morphologies. In binary homopolymer blends the BCP selectively co-assembles with hydrophilic inorganic precursors to form ordered mesostructures that lower total polymer interfacial area and interfacial energy between the two homopolymers. Discrete inorganic spheres or hollow spheres can be obtained after calcination. This approach enables a high degree of control over pore structures, pore size, particle size, inner cavity size and chemical composition of the resulting inorganic spheres.