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Evolution of Ordered Block Copolymer Serpentines into a Macroscopic, Hierarchically Ordered Web[1] ZHIQUN LIN, Iowa State University, SUCK WON HONG, JUN WANG — Cylinder-forming diblock copolymer solutions are confined in a restricted geometry comprised of a spherical lens placed upon a flat substrate. At the micrometer scale, the synergy of the controlled evaporative self-assembly of a polymer solution and controlled fingering instabilities mediated by the interaction between the polymer and substrate yields intriguing concentric serpentine microstructures of diblock copolymer over large areas. Selective solvent vapor annealing then transforms these microstructures into a macroscopic web-like pattern composed of regularly arranged microporous mesh arrays, at the same time forming domains of closely packed, nanoscopic hexagonal cylinders of diblock copolymer that are vertically oriented to the surface of the web at the nanoscale. This approach thus utilizes two consecutive self-assembly processes to precisely organize unique nanomaterials into spatially ordered structures that can serve as functional materials for potential applications in optical, electronic, and photonic devices, templates for complex structures and pattern transfer, among other areas.

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