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Unveiling the Kinetics of Block Copolymer Micelles Close Packing by In Situ GISAXS

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Packing spheres has long been a key topic in science. While hard spheres often form dense, close-packed structures like face-centered cubic (FCC) lattices, soft spheres, such as block copolymers in selective solvents, tend to arrange into less dense structures. However, when using block copolymer templates in the sol-gel method, these soft spheres can achieve close-packed structures. In this study, in situ grazing-incidence small-angle X-ray scattering (GISAXS) is used to examine the self-assembly and co-assembly processes during the formation of close-packing structures. The results reveal that the hybrid films preferentially develop an FCC structure with cluster nuclei. After the polymer template is removed, a superlattice-like mesoporous metal oxide film is obtained, showcasing the potential for advanced applications due to its well-organized nanostructures.

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