Ordered mesoporous materials derived by block-copolymer assisted self-assembly

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Ordered mesoporous materials containing periodic mesopores (diameter in 2-50 nm) have been actively applied in various applications including sensors, catalysts, separations, and energy conversions/storages. The porous materials, compared with equivalent materials in the bulk form, have different chemical and physical properties; i) high surface area, ii) large pore volumes, iii) fast diffusion of reactants/products, and iv) improved catalytic properties. In this study, we present the bottom-up synthesis approaches for developing ordered mesoporous materials; block copolymer (BCP) assisted one-pot self-assembly method. An amphiphilic BCP was used as a structural directing agent for mesopores. During evaporation of solvent, inorganic species selectively interact with hydrophilic block in BPC. By controlling synthetic condition, such as, precursors/BCP pairs, relative ratio, and heat-treatment condition, we can design various ordered periodic structures. We present two different ordered mesoporous inorganic materials such as titanium-niobium multi-metallic oxides and titanium nitride.