Poster Presentation

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Live templates for synthesis of mesoporous TiO2 via guest exchange

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In this work, we introduce a facile method based on host–guest chemistry to synthesize a range of nanostructured TiO2 materials using supramolecular templates of a dendron-jacketed block copolymer (DJBCP). The DJBCP is composed of amphiphilic dendrons (4′-(3,4,5-tridodecyloxybenzoyloxy)benzoic acid, TDB) selectively incorporated into a P4VP block of polystyrene-block-poly(4-vinylpyridine) (PS-b-P4VP) via hydrogen bonding. The PS-b-P4VP host acts as a structure-directing template, while the guest molecules (TDB) assist the self-assembly nanostructures and zone-axis alignment, resulting in the nanostructured template of vertically oriented cylinders formed via successive phase transformations from Im3¯m to R3¯m to P6mm upon thermal annealing in the doctor-blade-cast film. The guest molecules subsequently direct the titania precursors into the P4VP domains of the templates via supramolecular guest exchange during immersion of the film in a designated precursor solution containing a P4VP-selective solvent. The subsequent UV irradiation step leads to the formation of PS-b-P4VP/TiO2 hybrids. Finally, removal of the host template by calcination leaves behind mesoporous channels and makes sacrifices to be a carbon source for carbon-doping TiO2 materials. Various TiO2 nanoarchitectures, namely, vertical and wiggly micrometer-length channels, inverse opals, fingerprint-like channels, heterogeneous multilayers, and nanotubes, have been fabricated by highly tunable DJBCP nanostructures.

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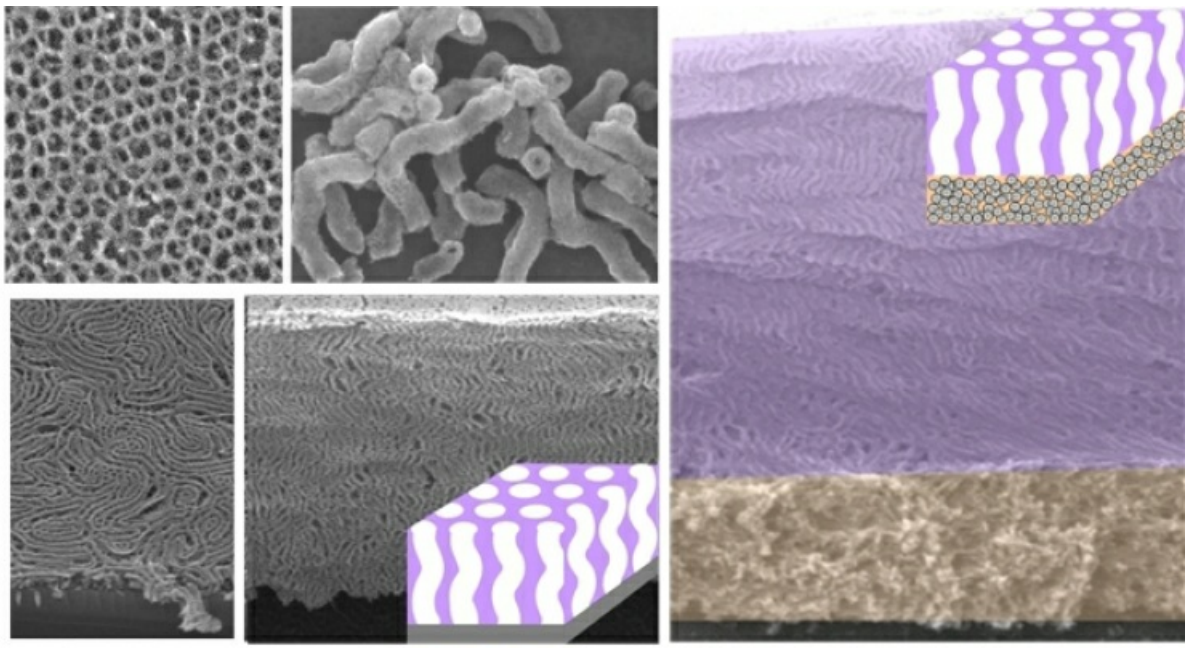

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