

Synthesis of Meso-Macroporous Titania Particles by Multiscale Templating Method

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Meso-Macroporous rutile titania particles could be prepared by emulsion-assisted surfactant and colloidal templating, in which non-aqueous emulsions have been used since titanium tetraisopropoxide, or sol-gel precursor, is highly reactive particularly with water. Those are potentially useful for electrode in dye-sensitized solar cells, photocatalyst, ultra white pigments, reflective paints and so on. Crosslinked polystyrene beads (~400 nm) and oil-soluble blockcopolymer were dissolved in toluene and the toluene-in-formamide emulsions were prepared using high-speed homogenizer. Then, toluene was evaporated by heating and mesoporous titania walls were formed around polystyrene beads by sol-gel process. Through two-step heat treatment, meso-macroporous rutile titania particles were produced. In first heat treatment without oxygen, carbon-titania macroporous particles were formed and mesopores were formed in the rutile titania walls. Therefore, their macropores and mesopores were well defined and ordered. Furthermore, their thermal and mechanical stability are relatively high.