

Synthesis and characterization of monodisperse mesoporous TiO₂ using different templates

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Abstract

This study aims to investigate the synthesis of single-phase nano-titanium using titanium (IV) isopropoxide (TTIP) as a precursor and two types of surfactant as structure directing agent or template; CTAB and TTAB. Double-phase and co-condensation techniques are employed for the synthesis. The formation of titanium nanoparticles occurs at about 60-80 °C under atmospheric pressure and the basic environment. To obtain a single-phase nano-titanium, the obtained as-synthesized TiO₂ are dried and burned at 500-550 °C. The burned particles are then analyzed and tested with various analytical techniques. Water retention is analyzed by dripping with deionized water (DI-water). Surface area and porous volume were analyzed by BET technique while the size and distribution of porosity were analyzed by BJH method with nitrogen adsorption (N₂-isotherm). Morphology and internal nanostructure of particles were analyzed through the SEM and TEM techniques. Composition of particle was analyzed by XRD technique and tailoring of functional groups on particles were analyzed by TGA and FTIR techniques. UV-vis technique was used to determine the energy band gap. Results from preliminary experiment showed the successful synthesis of TiO₂ nanoparticles with highly porous surfaces in which can be utilized in various applications like preparation of nanocomposite membranes, agriculture and solar cells.

Keywords: Synthesis; Monodisperse; Mesoporous; TiO₂; Nanoparticles.

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