Flower-Like TiO_2 Nanospheres Directly from Block-Graft Copolymer Precursors and Their Uses in Quasi-solid-state Dye-sensitized Solar Cells

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We report a lowtemperature synthetic method for preparing flower-like TiO_2 nanospheres (f-TiO_2 NS) directly from an amphiphilic block-graft copolymer precursor. The copolymer, consisting of poly(ethylene glycol) titanium triisopropoxide (PEGTTIP) and polystyrene (PS), was synthesized via atom transfer radical polymerization (ATRP) and was characterized by Fourier transform infrared (FT-IR) spectroscopy. The copolymer was directly hydrolyzed at 90 °C for 6 h without any additivesto generate rutile-phase f-TiO_2 NS that were approximately 800 nm in size, as confirmed by field emission scanning electron microscopy (FE-SEM), energy-filtering transmission electron microscopy (EF-TEM) and X-ray diffraction (XRD). The energy conversion efficiency of quasi-solid-state dye-sensitized solar cells (qssDSSCs) fabricated with f-TiO_2 NS (4.4 % at 100 mW/cm^2) as a scattering layer (SL) was greater than those without f-TiO2NS (3.8% for 10 □m, 3.9% for 17 □m) and was quite comparable to cells with a commercial scattering layer (CSL).