

Synthesis of TiO₂ Nanostructures with Various Morphologies for Dye-Sensitized Solar Cells: Controlling Light Harvesting, Electron Transport and Recombination

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Abstract

Several kinds of TiO₂ nanostructures including nanoparticles, nanowires, nanotubes, corn-like nanowires, skein-like nanotubes, dandelion-like particles, rice-like particles, hollow spheres and nanocubes are prepared by wet chemistry methods. Their morphology and crystal structures can be controlled by changing the processing parameters. They are used as photoanodes to assemble dye-sensitized solar cells (DSCs) by a new paste formulation, and the photovoltaic performance is correlated with the nanostructure. Moreover, CNT-TiO₂ and Graphene-TiO₂ hybrids as well as Ag-TiO₂ and BaTiO₃-TiO₂ are synthesized and employed to enhance the cell efficiency. This talk highlights several significant advancements in understanding of light harvesting, electron transport and recombination in nanostructured TiO₂ DSCs and the limitations that these processes impose on cell performance.