Mesoporous TiO$_2$ Particle for Dye Sensitized Solar Cell

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Solar cells on dye-sensitization of TiO$_2$ electrode are regarded as a regenerative low-cost alternative to conventional solid-state devices. Various forms of nanocrystalline TiO$_2$ have been extensively investigated as a potential material for dye-sensitized solar cells (DSSCs). In addition to this, a great deal of attention has been focused on developing novel sensitizers, electrolytes, and semiconductor electrode materials.

For the DSSCs, the TiO$_2$ materials should have high surface areas so that the dye molecules can be sufficiently adsorbed, resulting in the generation of a high photocurrent. In this study, mesoporous TiO$_2$ was synthesized by a nanocasting method using mesoporous silica as the template. The mesoporous TiO$_2$ has not only a high surface area (about 220 m$^2$/g), but also uniform nanochannels that can be easily accessed by the electrolyte for I$_3^-$ ion transport. In the present work, we describe the synthesis of the mesoporous TiO$_2$ materials and utilization of the materials for an electrode material in DSSCs.