

## Synthesis of Porous TiO<sub>2</sub> Thin Films Templated By Amphiphilic Graft Copolymer and Their Use in Dye-Sensitized Solar Cells

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Porous TiO<sub>2</sub> thin films have been prepared using an amphiphilic graft copolymer, i.e. poly(vinylidene fluoride-co-chlorotrifluoroethylene)-graft-poly(oxyethylene methacrylate) (P(VDF-co-CTFE)-g-POEM) as a structure-directing agent via the sol-gel process. The graft copolymer was synthesized via atom transfer radical polymerization using CTFE units as an initiating site and designed to have a hydrophobic P(VDF-co-CTFE) domain and a hydrophilic POEM domain. Fourier transform-infra red spectroscopy indicated that a hydrophilic titania precursor was selectively incorporated into hydrophilic POEM domains. In-situ formation and morphologies of porous TiO<sub>2</sub> thin films were confirmed by ultraviolet-visible spectroscopy, X-ray diffraction, transmission electron microscopy and thermogravimetric analysis. The resultant porous TiO<sub>2</sub> films with 10-25 nm in size were used as a photoelectrode for solid-state dye-sensitized solar cells, exhibiting energy conversion efficiency of 2.8% at 100 mW/cm<sup>2</sup>.