Photovoltaic Performance of Nanostructured TiO_2 Replicas from KIT-6, SBA-15 and MSU-H for Dye-Sensitized Solar Cells

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Highly dispersed TiO_2 nanoparticles were synthesized by a template method using mesoporous materials such as SBA-15, KIT-6 and MSU-H. The as-synthesized samples were characterized with powder X-ray diffraction (XRD), Atomic force microscopy (AFM), Fourier transform infrared spectroscopy (FT-IR), Raman spectroscopy, small-angle X-ray diffraction (SAXRD), transmission electron microscopy (TEM), and nitrogen adsorption. The energy conversion efficiency of nanostructured TiO_2 replicas from KIT-6, SBA-15 and MSU-H for dye-sensitized solar cells as a working electrode was investigated from photocurrent-potential curves. A nonlinear least-square optimization method was used to determine model parameters of the one-diode model based on an equivalent circuit analysis. It was found that the influence of pore size and shape of nanostructured TiO_2 on photovoltaic performance was a significant.