The Photoelectrical Properties of Dye-Sensitized TiO_2 Electrode with Repeated Coating

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In order to develop high efficiency dye-sensitized solar cells, the tuning of TiO_2 photoelectrode morphology towards optimization of solar energy conversion efficiency has been investigated.
The mesoporous TiO_2 films were fabricated on conducting glasses by repetitive coating and calcined at 450 °C for 30 min. The amount of dye incorporation was found to be highly dependent on the microstructure and the thickness of titanium oxide thin films. Surface morphologies were studied with scanning electron microscopy (SEM) and atomic force microscopy (AFM) and the film thickness was determined by surface profilometry using a Tencor Alpha-Step instrument. The TiO2 film obtained by the two times repetitive coating (12μm thickness) resulted in the 1.4 times higher energy conversion efficiency of the dye-sensitized solar cells than that of the one time coating TiO_2 film (Voc= 660 mV, Jsc= 16.4 mA/cm2, the fill factor=0.62 and η=6.8%).