Electronic Supplementary Information

Self-Assembled Ultrathin Titania Nanosheets as Blocking Layers for Significantly Enhanced Photocurrent and Photovoltage of Dye-Sensitized Solar Cells

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Characterizations. The morphologies of the titania nanosheets were observed on high-resolution transmission electron microscope (TEM, JEM-2100F, JEOL) and field-emitting scanning electron microscope (FESEM, S-4800, Hitachi, Japan). The thickness of the blocking layer is estimated with FESEM. X-ray diffraction (XRD) was performed on D8 Advance (Bruker, Cu Kα radiation: $\lambda = 0.154$ nm). The film thickness was measured using a surface profiler (Veeco Dektak 150, USA). The UV-vis spectra were recorded on Shimadzu UV-2550 UV-vis spectrometer. An electrochemical workstation (ZAHNER ZENNIUM CIMPS-1, Germany) was used to perform intensity modulated photocurrent/photovoltage spectroscopy (IMPS/IMVS) and charge extraction under illumination of white light from a light emitting diode (LED). The intensity-modulated spectra were measured at room temperature with light intensity ranging from 10 to 120 W m^{-2} in modulation frequency ranging from 0.1 Hz to 10 kHz with modulation amplitude less than 5% of the light intensity. A Keithley-2420 source meter in combination with a Sol3A class AAA solar simulator IEC/JIS/ASTM equipped with an AM1.5G filter and a 450 W Xenon lamp was used to measure the current-voltage curves of solar cells. The intensity of light was calibrated with a reference silicon solar cell (Oriel-91150). To avoid stray light, a black mask with an aperture area of 0.2304 cm^2 was put on the surface of devices during measurements.

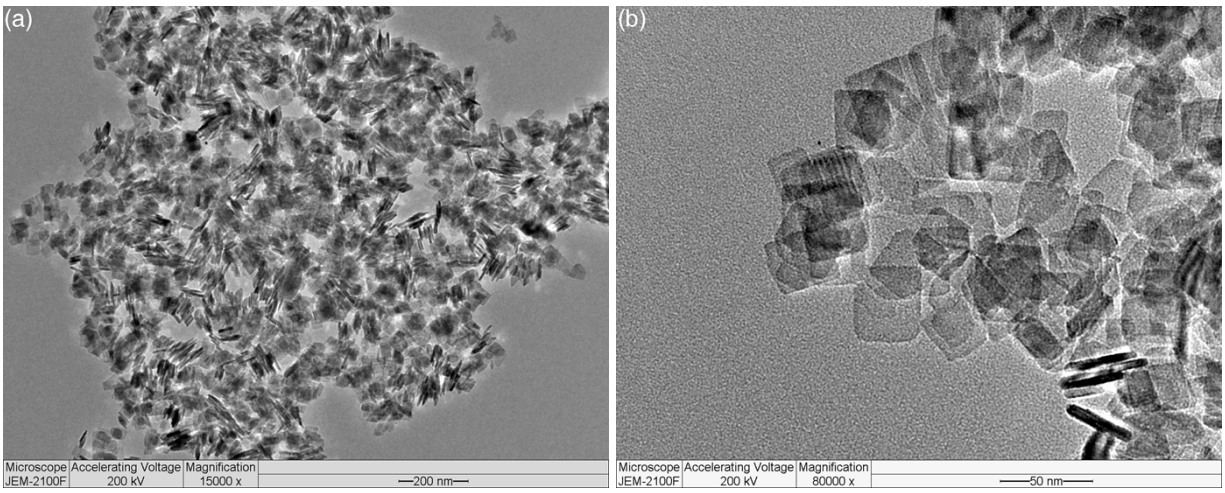

Figure S1. TEM images of the titania nanosheets with different magnifications

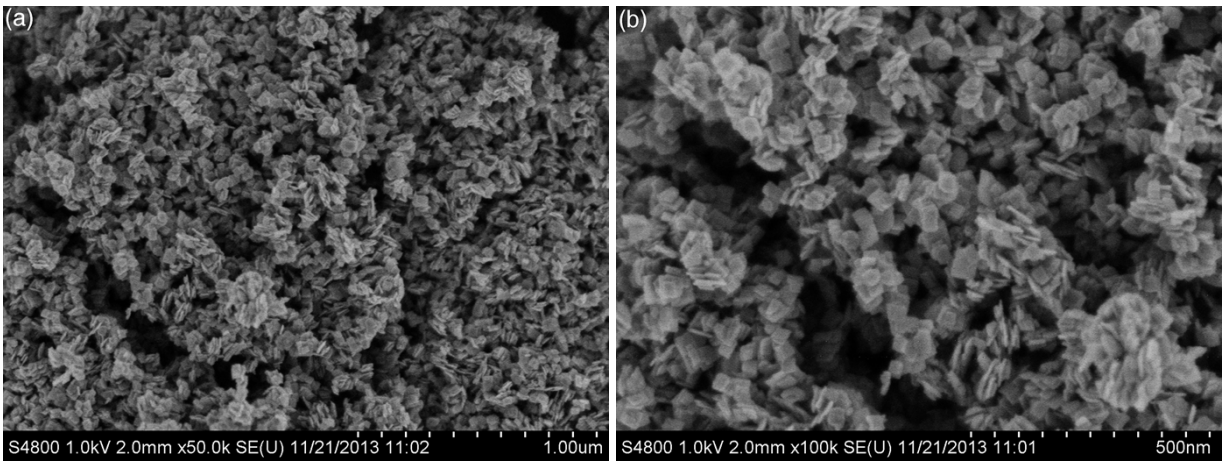

Figure S2. SEM images of the titania nanosheet powder with different magnifications

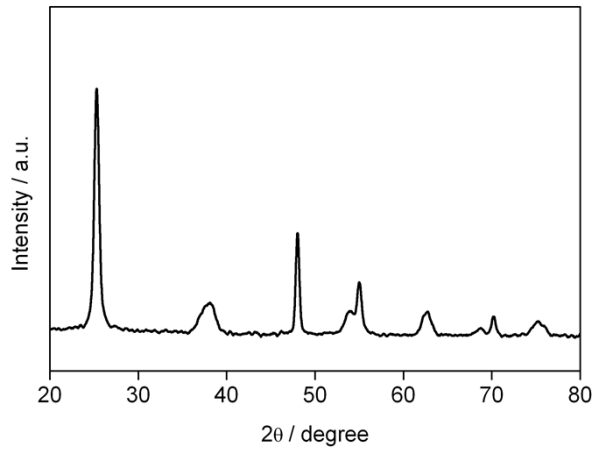

Figure S3. XRD spectrum of the titania nanosheets

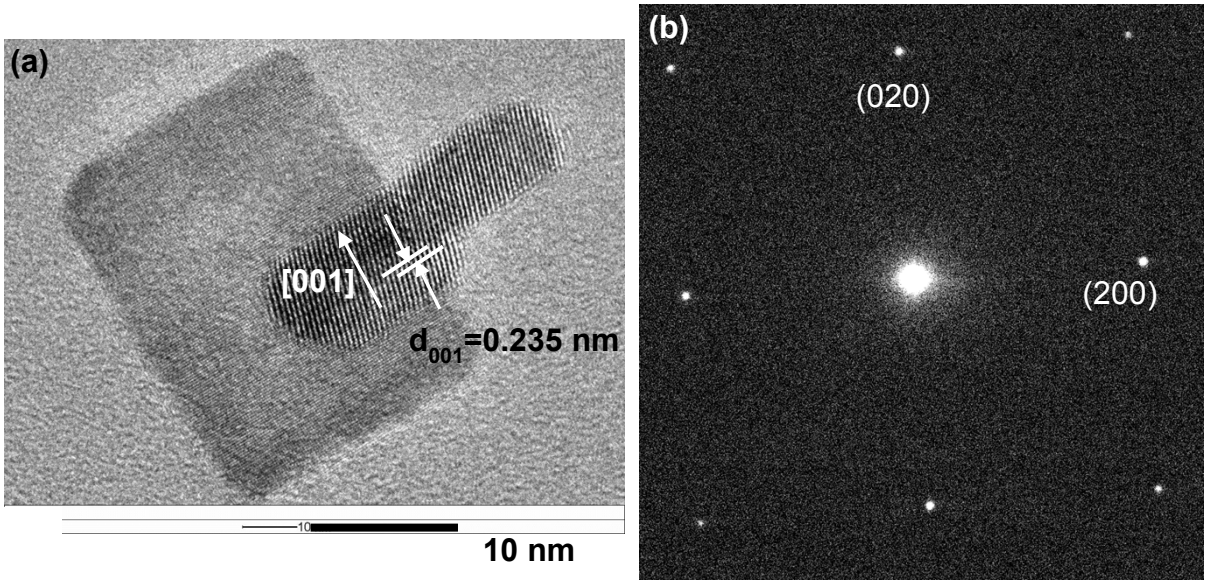

Figure S4. (a) High-resolution TEM image of an individual vertical nanosheet and (b) the corresponding SAED pattern.

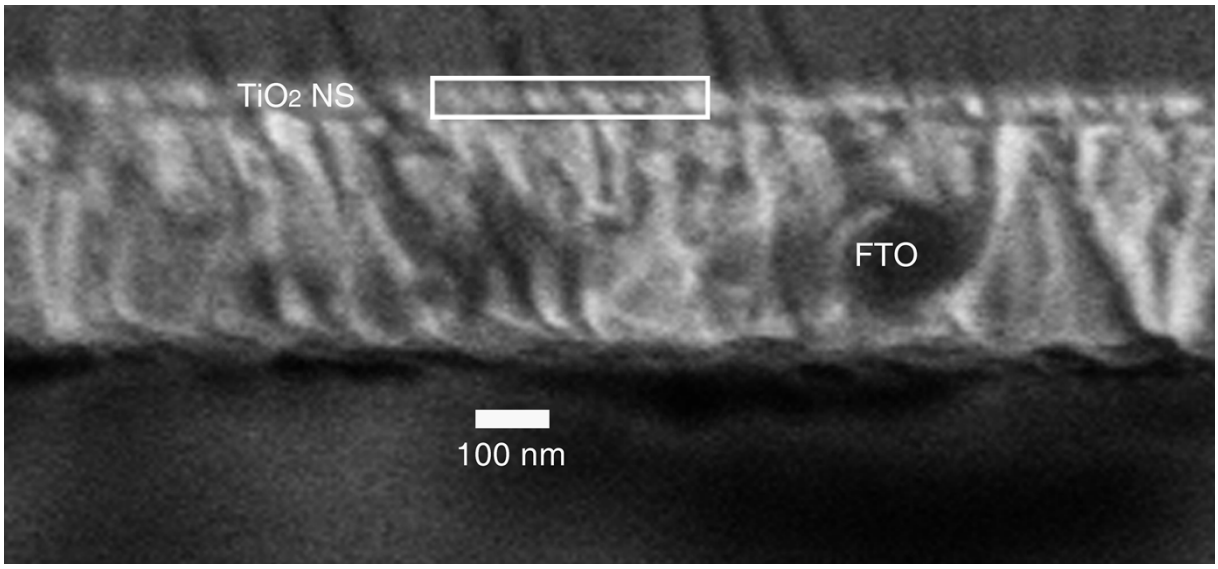

Figure S5. Magnified cross-section SEM image of the 10-layer nanosheet film.

Table S1. Sheet resistance of FTO with and without a blocking layer

	Sheet resistance (Ω/square)
FTO	14
FTO/1-layer-NS	30
FTO/2-layer-NS	35
FTO/5-layer-NS	45
FTO/10-layer-NS	60
FTO/pyrolyzed TiO_2 (~50 nm)	55