Synthesis and dye-sensitized solar cell performance of nanorods/nanoparticles TiO2 from high surface area nanosheet TiO2

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Source:

JOURNAL OF NANOSCIENCE AND NANOTECHNOLOGY **Volume:** 6 **Issue:** 12 **Pages:** 3685-3692 **DOI:** 10.1166/jnn.2006.612 **Published:** DEC 2006

Abstract:

High surface area nanosheet TiO2 with mesoporous structure were synthesized by hydrothermal method at 130 degrees C for 12 h. The samples characterized by XRD, SEM, TEM, SAED, and BET surface area. The nanosheet structure was slightly curved and approximately 50-100 nm in width and several nanometers in thickness. The as-synthesized nanosheet TiO2 had average pore diameter about 3-4 nm. The BET surface area and pore volume of the sample were about 642 m(2) /g and 0.774 cm(3)/g, respectively. The nanosheet structure after calcinations were changed into nanorods/nanoparticles composite with anatase TiO2 structure at 300-500 degrees C (10-15 nm in rods diameter and about 5-10 nm in particles diameter). The solar energy conversion efficiency (71) of the cell using nanorods/nanoparticles TiO2 (from the nanosheet calcined at 450 degrees C for 2 h) with mesoporous structure was about 7.08% with Jsc of 16.35 mA/cm(2), Voc of 0.703 V and ff of 0.627; while eta of the cell using P-25 reached 5.82% with Jsc of 12.74 mA/cm(2), Voc of 0.704 V, and ff of 0.649.

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