

Synthesis, characterization, photocatalytic activity and dye-sensitized solar cell performance of nanorods/nanoparticles TiO₂ with mesoporous structure

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Abstract:

Nanorods/nanoparticles TiO₂ with mesoporous structure were synthesized by hydrothermal method at 150 degrees C for 20h. The samples characterized by XRD, SEM, TEM, SAED, HRTEM, and BET surface area. The nanorods had diameter about 10-20 nm and the lengths of 100-200 nm, the nanoparticles had diameter about 5-10nm. The prepared material had average pore diameter about 7-12nm. The BET surface area and pore volume of the sample are about 203 m²/g and 0.655 cm³/g, respectively. The nanorods/nanoparticles TiO₂ with mesoporous structure showed higher photocatalytic activity (I-3(-) concentration) than the nanorods TiO₂, nanotibers TiO₂, mesoporous TiO₂, and commercial TiO₂ (ST-01, P-25, JRC-01, and JRC-03). The solar energy conversion efficiency (eta) of the cell using nanorods/nanoparticles TiO₂ with mesoporous structure was about 7.12% with J(sc) of 13.97 mA/cm², V-oc of 0.73 V-oc and f(f) of 0.70; while eta of the cell using P-25 reached 5.82% with J(sc) of 12.74 mA/cm², V-oc of 0.704 V, and f(f) of 0.649. (c) 2006 Elsevier B.V. All rights reserved.

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