

Growth, properties and dye-sensitized solar cells applications of ZnO nanorods grown by low-temperature solution process

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Abstract:

Hexagonal-shaped small ZnO nanorods were grown in a large-quantity via simple aqueous solution process by using zinc nitrate as a source of zinc ions at low-temperature under stirring. The as-grown hexagonal-shaped ZnO nanorods were characterized in detail in terms of their structural, optical and photovoltaic properties. The detailed structural investigations by HRTEM, SAED and FFT revealed that the as-synthesized ZnO nanorods are well-crystalline, possessing a perfect hexagonal ideal growth habits of wurtzite zinc oxide and grown along the [0001] direction in preference. The optical properties, composition and quality of the as-synthesized nanorods were examined by using UV-visible and FTIR spectroscopy. Moreover, films of as-grown nanorods were used as photoanode materials to fabricate the dye sensitized solar cells (DSSCs). An overall light to electricity conversion efficiency of 0.70 % with a fill factor of 47.2%, short-circuit current of 1.8 mA/cm² and open-circuit voltage of 0.76 V were achieved for the solar cell based on hexagonal-shaped small ZnO nanorods.

Super lattices and Microstructures 45, 529 (2009)