P242 Charge transport and recombination of dye sensitized 1D nanostructured-TiO2 films prepared by reactive sputtering

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Dye sensitized solar cells (DSCs) are governed by light absorption, charge injection, electron transport and recombination and electrolyte diffusion. One way to improve the efficiency of these devices is by the design of highly ordered nanostructured semiconductor materials.[1] The advantages can be two-fold: Firstly charge transport within the metal-oxide can be enhanced and hence thicker films can be employed and secondly, the complete permeation with a solid-state hole-transport medium of the sensitized metal-oxide can be facilitated.

Nanostructured materials should promote vectorial electron diffusion and have as few recombination sights as possible so as to further enhance electron lifetimes and electron collection efficiencies. These materials should also have a high surface area so as to allow for efficient dye-loading and hence light absorption.

Highly ordered TiO_2 nanostructured films were prepared by reactive sputtering[2, 3, 4] and their charge transport characteristics evaluated in DSCs. These were compared to DSCs employing mesoporous TiO_2 films prepared by doctor blade technique using commercial paste. Charge transport characteristics were evaluated by impedance spectroscopy (IS), incident photon to current conversion efficiencies (IPCE) and current-voltage (iV) curves under simulated AM1.5G irradiation. Film morphology and structural properties were evaluated by scanning electron microscopy (SEM) and X-ray diffraction (XRD), respectively.

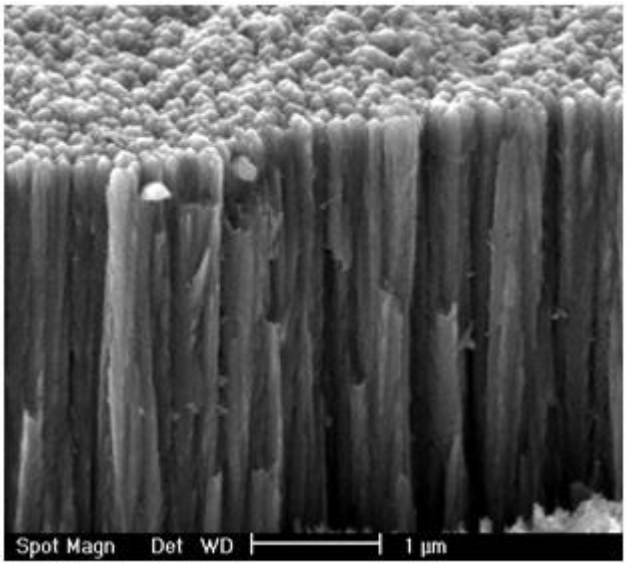

Figure 1 Figure 1 – SEM image of a 1D TiO2 nanostructured film prepared by reactive sputtering.

References

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