Mesoporous Titania-Vertical Nanorod Films With Interfacial Engineering For High Performance Dye-Sensitized Solar Cells

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ABSTRACT

Working electrode (WE) fabrication offers significant challenges in terms of achieving high-efficiency dye-sensitized solar cells (DSCs). We have combined the beneficial effects of vertical nanorods grown on conducting glass substrate for charge transport and mesoporous particles for dye loading and have achieved a high photoconversion efficiency of (η) > 11% with an internal quantum efficiency of ~93% in electrode films of thickness ~7 ± 0.5 μm. Controlling the interface between the vertical nanorods and the mesoporous film is a crucial step in attaining high η. We identify three parameters, viz., large surface area of nanoparticles, increased light scattering of the nanorod-nanoparticle layer, and superior charge transport of nanorods, that simultaneously contribute to the improved photovoltaic performance of the WE developed.

KEYWORDS: Interfacial engineering; light scattering; nanoenergy; nanowire supported films; photovoltaics

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