One-dimensional core-shell structures with TiO_2 nanosheets and SnO_2 nanotubes, and their applications to solid-state dye-sensitized solar cells

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In this work, a unique structure of the photoanode consisting of SNT(SnO2 nanotube)-TNS(TiO2 nanosheet) core–shell particles (SNT@TNS) which are inter-dispersed in well-organized mesoporous (wOM) TiO2 films for high efficiency ssDSSCs (Solid-State Dye0sensitized Solar Cells). The SNTs were coated with TNSs via a solvothermal reaction while the SNTs were prepared by electrospinning, and then the TNSs would reduce the recombination of electrons dominantly occurring on the surface of SNTs and provide a large surface area. The presence of 1D SNT@TNS in the wOM-TiO2 films plays two critical roles, that is, the acceleration of electron transfer and the enhancement of light scattering, without sacrificing surface area. Thus, the synergy effects combining the high surface area of wOM-TiO2 structure, promoted electron transport and light scattering SNT@TNS structure can lead to the significant increase of conversion efficiency of DSSCs of 9.31%(7.82% with mask) as compared with 7.05% (5.95% with mask) for just wOM-TiO2 system.