Interface Tuning Approach for High Performance I_2-Free Solid-State Dye-Sensitized Solar Cells

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We report I_2-free solid-state dye-sensitized solar cell (ssDSSC) with 6.8 % energy conversion efficiency, one of the highest for N719 dye, as a result of enhanced transmittance of nanostructured interfacial layer and high conductivity of hole transporting material (HTM). The excellent performance was achieved via careful control of the electrode/HTM and nanocrystalline TiO_2/conducting glass interfaces. Solid-state polymerized conducting polymers, poly(3,4-ethylenedioxythiophene) (PEDOT) and poly(3,4-ethylenedithiathiophene) (PEDTT), deeply infiltrated into the TiO_2 pores and functioned as an HTM. Furthermore, transparent organized mesoporous 550-nm-thick TiO_2 film with high porosity and good connectivity improved cell performance due to the increased transmittance of visible light, decreased interfacial resistance and enhanced electron lifetime.