Tuning of the flat-band potentials of nanocrystalline TiO_2 and SnO_2 particles with an outer-shell MgO layer

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ABSTRACT

Flat-Band (FB) potentials of TiO_2 and SnO_2 nanoparticles shifted negatively once they were coated with a thin insulating MgO layer. For core-shell structured TiO_2–MgO and SnO_2–MgO composites, incorporation of 1% (w/w) of MgO results in negative shift in FB potential of TiO_2 and SnO_2 nanoparticles by −0.15 eV and −0.38 eV, respectively. The negative shift of FB increased with the increase of MgO content. The highest shifts in FB potential reached −0.85 eV and −0.65–0.70 eV (vs Standard Calomel Electrode) when MgO content was equal to 10% (w/w) and 10–15% (w/w) for SnO_2 and TiO_2 respectively. In this investigation, interconnection between the negative shift in FB potential and the efficiencies of dye sensitized solar cells based on the prepared materials are discussed.