Electronic Supplementary Material (ESI) for Nanoscale

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Synthesis and photovoltaic property of fine and uniform Zn_2SnO_4 nanoparticles

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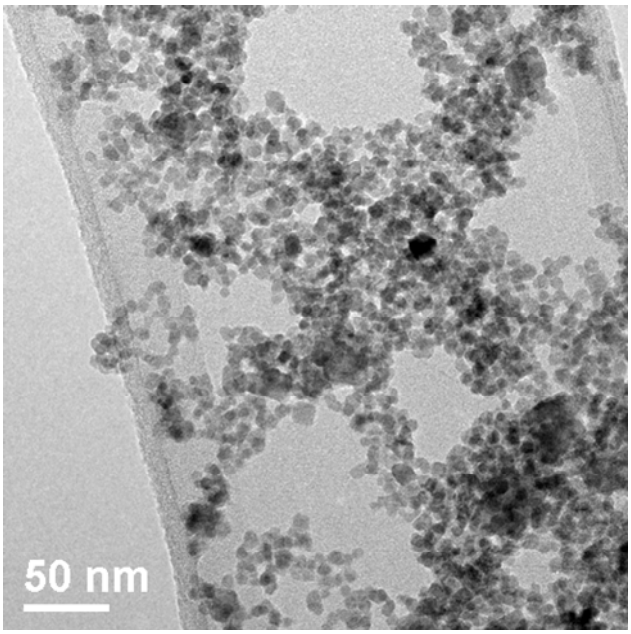

Fig. S1 Low magnified TEM image of Zn_2SnO_4 nanoparticles (NPs) that was synthesized by a hydrothermal reaction with ammonium carbonate (AC) addition as much as the AC/Zn mole ratio of 0.5 at 180 ^oC for 12 h.

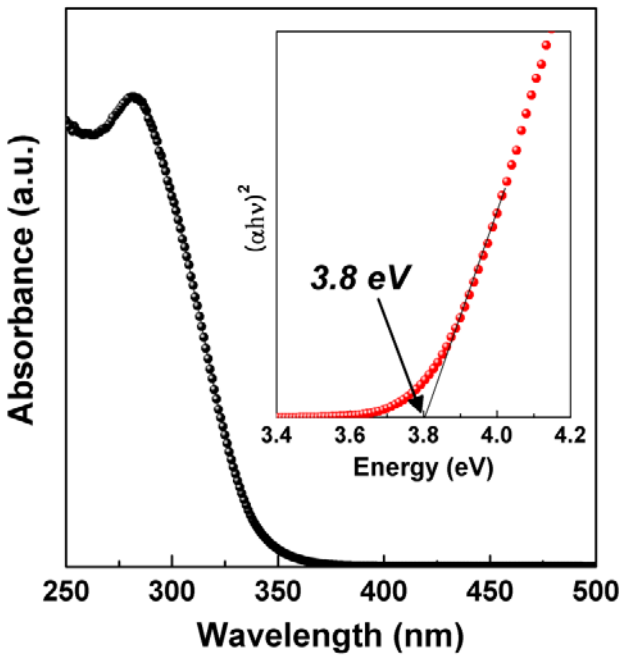

Fig. S2 Optical absorption spectrum of Zn_2SnO_4 NPs; inset, corresponding band gap determination.

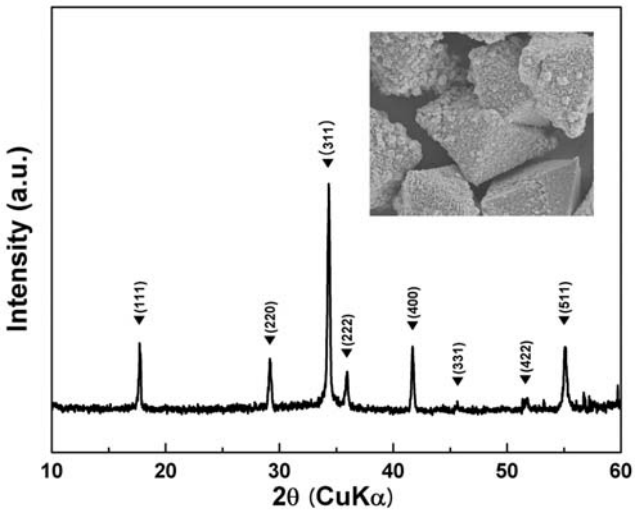

Fig. S3 XRD pattern and SEM image Zn_2SnO_4 powder synthesized by a hydrothermal reaction without AC addition at 200 ^oC for 12 h.

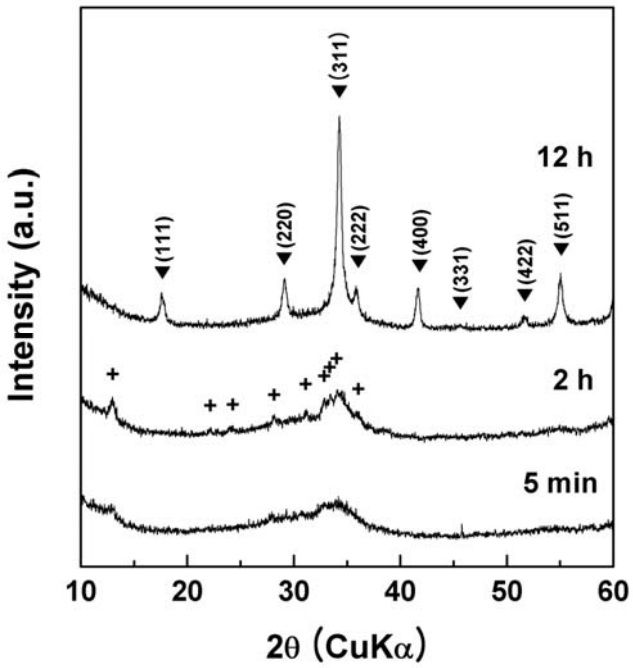

Fig. S4 XRD patterns of the powders prepared by reaction time-controlled experiments. All the diffraction peaks of powder obtained at a reaction time of 12 h are indexed to a cubic Zn_2SnO_4 (JCPDS No. 24-1470).

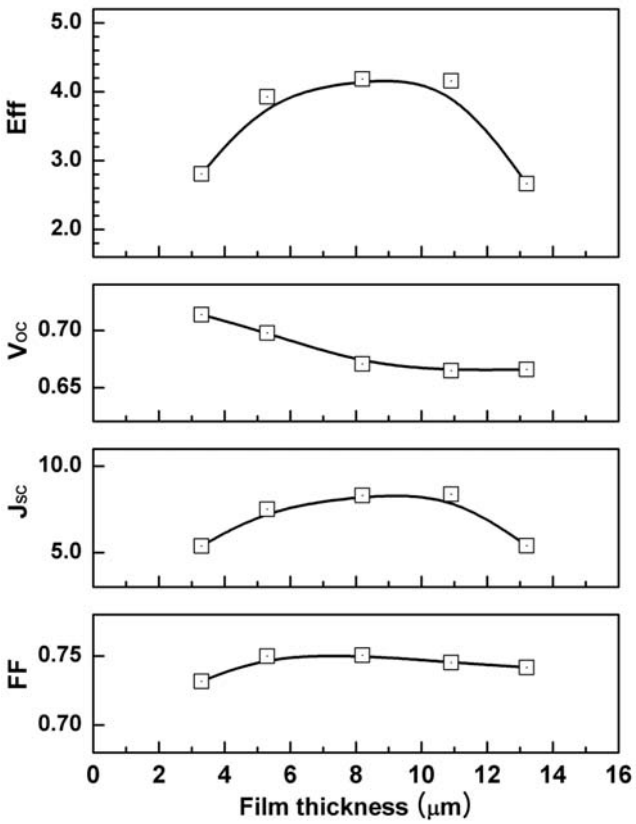

Fig. S5 J-V characteristics of the DSSCs employing Zn_2SnO_4 NP films as a function of film thickness.

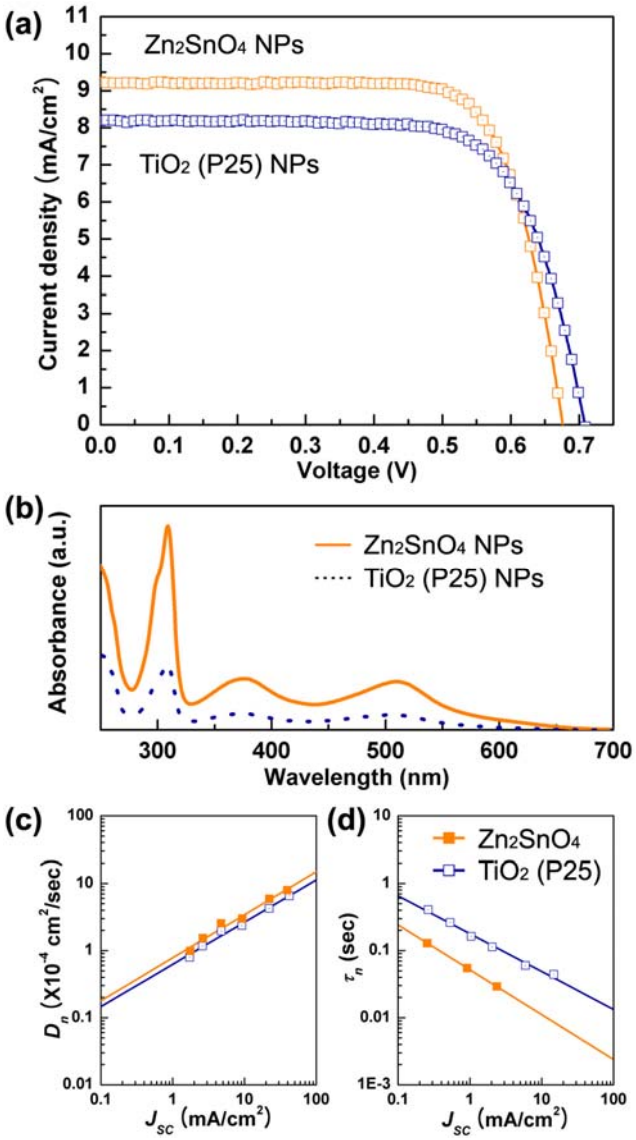

Fig. S6 Comparative studies of photovoltaic properties with DSSCs employing the ultra-fine Zn_2SnO_4 NPs and the commercial TiO_2 NPs (P25). (a) Photocurrent density-voltage (*J*-*V*) characteristics of DSSCs, (b) optical absorption spectra of the desorbed dye molecules from the Zn_2SnO_4 and TiO_2 photoelectrodes, and (c) Electron diffusion coefficients (D_n) and (d) lifetimes (τ_n) as a function of short circuit current (J_{SC}) that is obtained by the stepped light-induced transient measurements of photocurrent and photovoltage (SLIM-PCV)[1].

1 S. Nakade, T. Kanzaki and Y. Wada, S. Yanagida, *Langmuir*, 2005, **21**, 10803.