Electronic Supplementary Material (ESI) for RSC Advances

Nb-Doped TiO_2 Nanoparticles for Organic Dye-Sensitized Solar Cells

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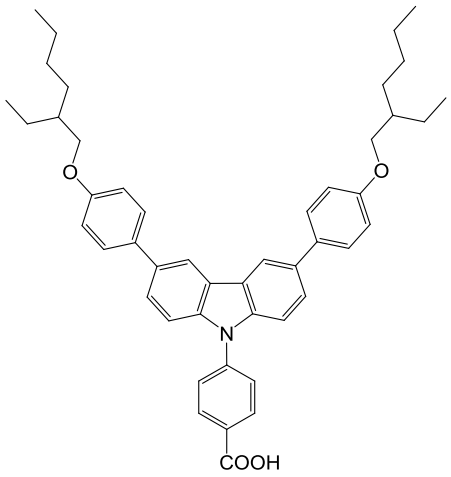

Fig. S1. Chemical structure of the multi-functional hole conductor coadsorbent (HC-A).

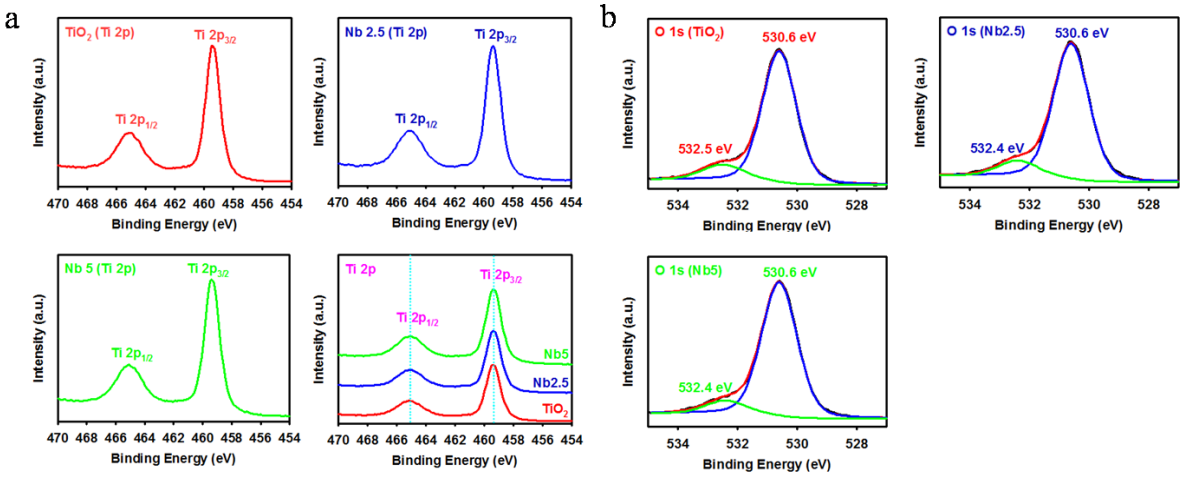

Fig. S2. XPS spectra of the (a) Ti 2p and (b) O 1s core levels of undoped and Nb-doped TiO_2.

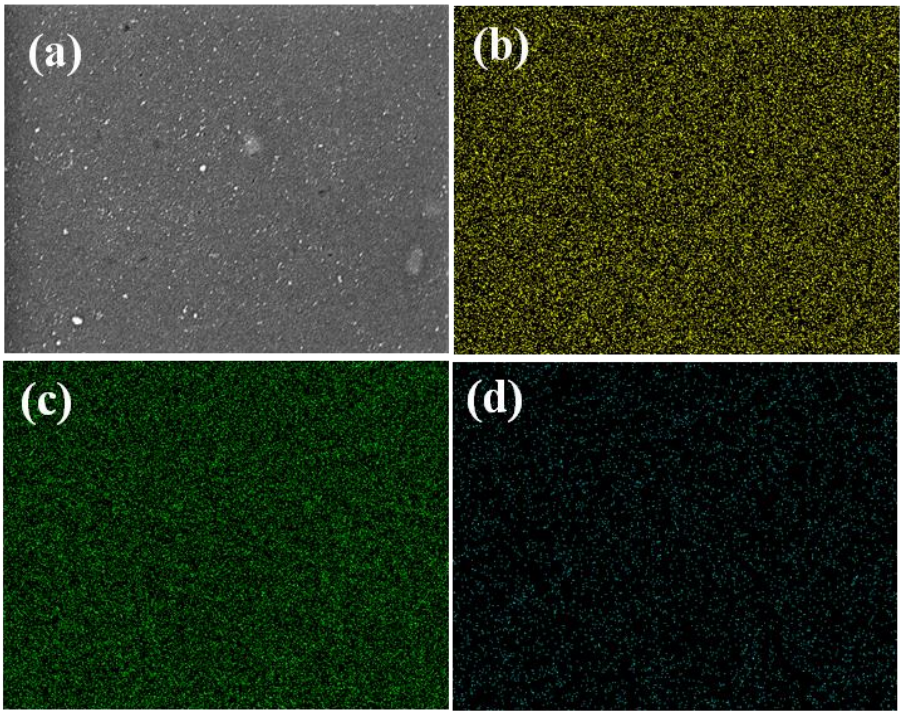

Fig. S3. EDX (FE-SEM) image (a) and element mappings of 5 mol% Nb-doped TiO_2; (b) titanium (Ti); (c) oxygen (O); (d) niobium (Nb).

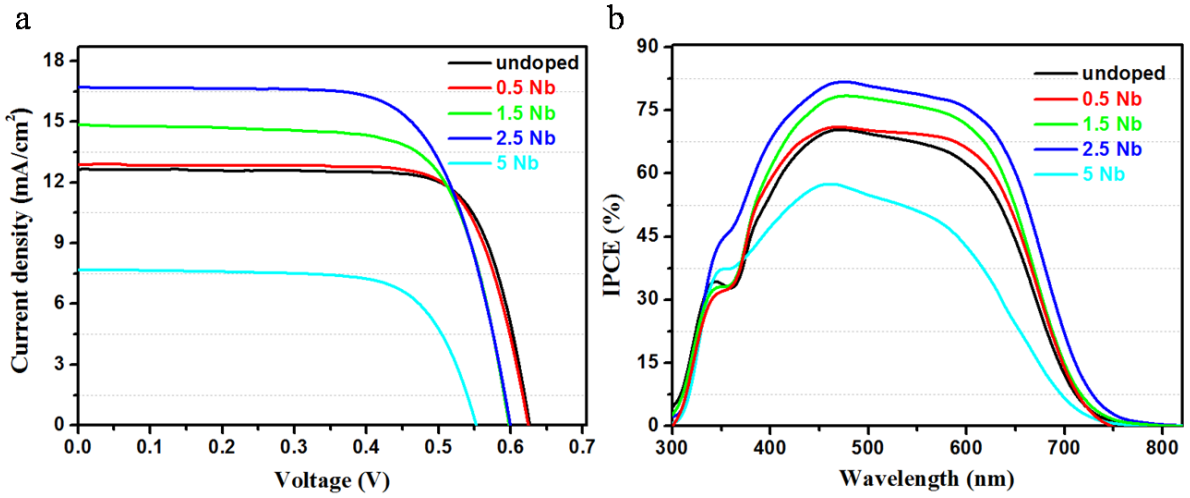

Fig. S4. (a) *J–V* curves of the NKX2677/DCA-sensitized DSSCs based on the pure TiO_2 and Nb-doped TiO_2 photoanodes with different Nb contents; (b) IPCE spectra of the same devices. The TiO_2 thickness and active area are 16 (8+8) μm and 0.16 cm^2 with a black metal mask, respectively.

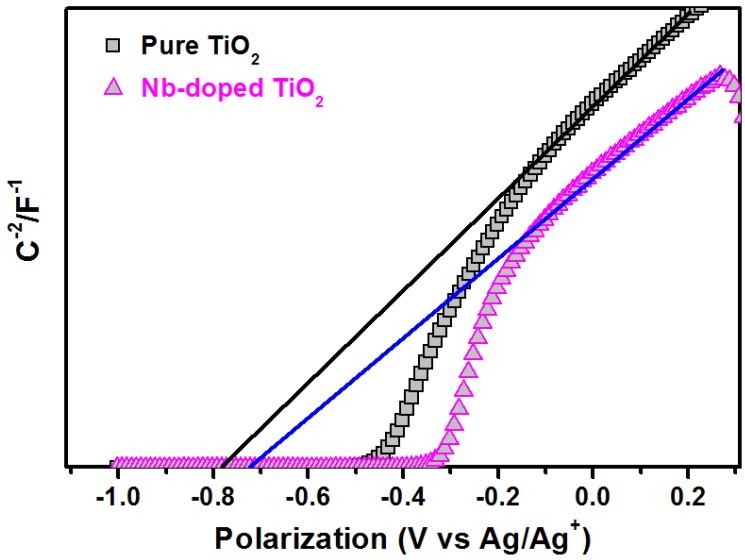

Fig. S5. Mott-Schottky plots for the DSSCs based on the undoped and 2.5 mol% Nb-doped TiO_2 films. The measurements were performed at f = 80 Hz with a small amplitude of 10 mV.

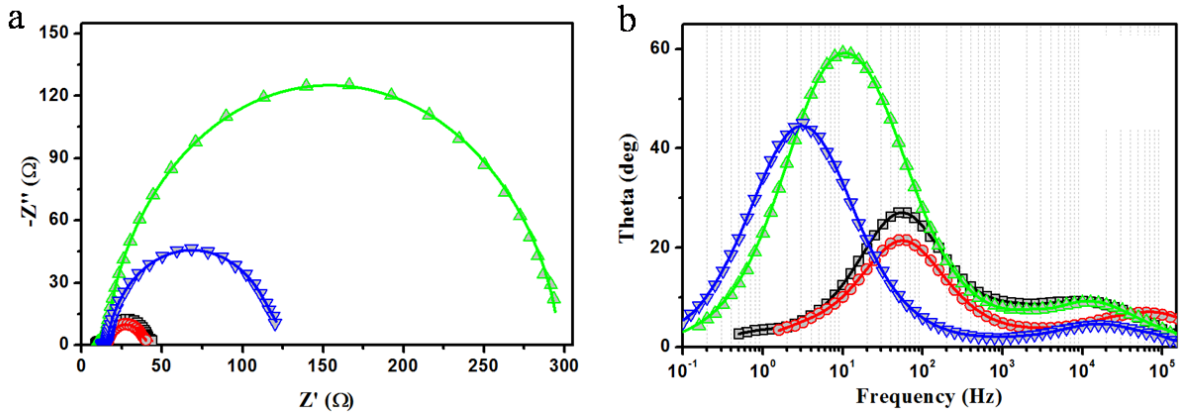

Fig. S6. (a) Nyquist plots of electrochemical impedance spectra measured at a forward bias of –0.6 V under dark conditions; (b) Bode plots obtained with the same devices. Undoped TiO_2 (NKX2677, black square); 2.5 mol% Nb-doped TiO_2 (NKX2677, red circle); undoped TiO_2 (NKX2677/HC-A, green triangle); 2.5 mol% Nb-doped TiO_2 (NKX2677/HC-A, blue triangle).

Table S1. Performance characteristics of the NKX2677/DCA-sensitized DSSCs based on the undoped and Nb-doped TiO_2 with different Nb contents.

Photoanodes (TiO_2)	J_{sc} (mA/cm^2)	V_{oc} (mV)	FF (%)	η (%)
Undoped	12.65	0.63	76.3	6.05
0.5 mol% Nb-doped	12.90	0.62	75.3	6.07
1.5 mol% Nb-doped	14.85	0.60	76.1	6.36
2.5 mol% Nb-doped	16.72	0.60	69.2	6.94
5 mol Nb-doped	7.70	0.55	52.3	3.01