Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A

Supporting Information

A highly crystalline Nb_3O_7F nanostructured photoelectrode: fabrication and photosensitisation

Haimin Zhang,[a] Yibing Li,[a] Yun Wang,[a] Porun Liu,[a] Huagui Yang,[a] Xiangdong Yao,[c] Taicheng An,[d] Barry J. Wood,[e] and Huijun Zhao*[a,b]

[a] Centre for Clean Environment and Energy, Griffith University, Gold Coast Campus, QLD 4222, Australia

[b] Centre for Environmental and Energy Nanomaterials, Institutes of Solid State Physics, Chinese Academy of Sciences, Hefei 230031, China

[c] QLD Micro- and Nanotechnology Centre, Griffith University, Nathan Campus, QLD 4111, Australia

[d] State Key Laboratory of Organic Geochemistry, Guangzhou Institute of Geochemistry, Chinese Academy of Sciences, Guangzhou 510640, China

[e] Centre for Microscopy & Microanalysis, The University of Queensland, St Lucia, QLD 4072, Australia

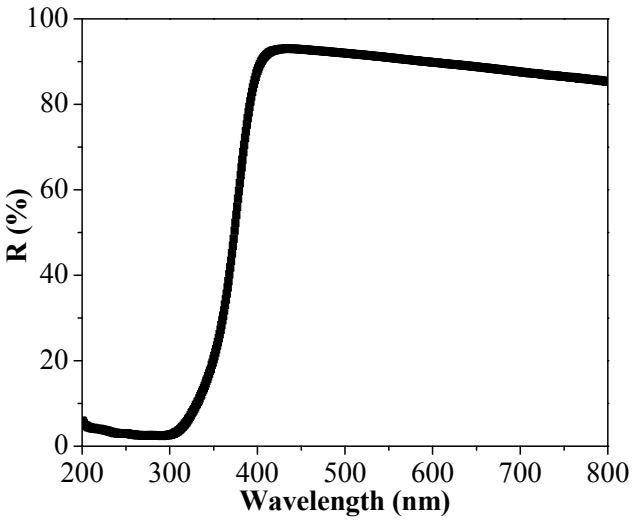

Figure SI-1. UV-vis diffuse reflectance spectra of the as-synthesised Nb_3O_7F nanostructured film.

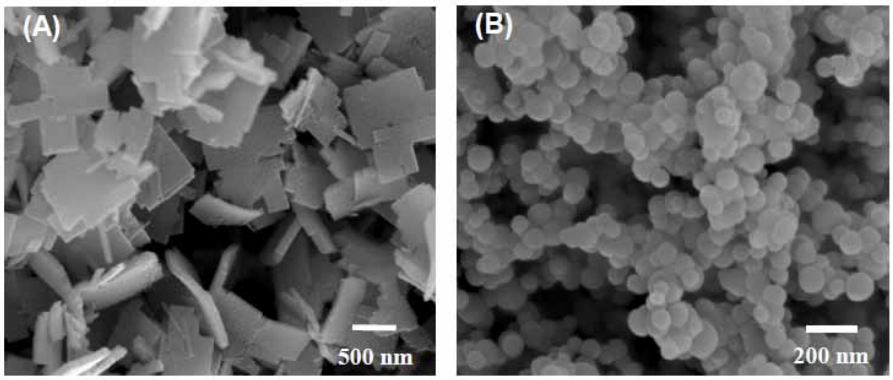

Figure SI-2. (A) and (B) SEM images of the as-synthesised samples obtained in 40 mL of 0.5% and 3.0% (v/v) HF solutions, respectively; $NbCl_5$ concentration of 0.05 M, hydrothermal reaction temperature of 200 ºC and reaction time of 3 h.

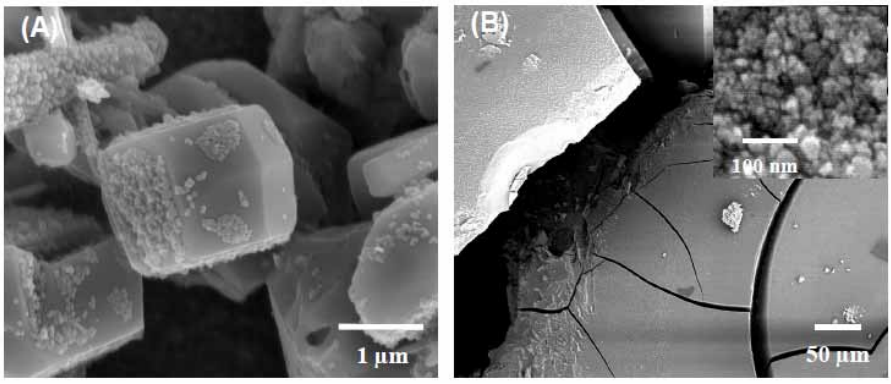

Figure SI-3. (A) and (B) SEM images of the as-synthesised samples with the $NbCl_5$ precursor concentrations of 0.01 M and 0.1 M, respectively; 40 mL of 1.0% (v/v) HF solution, hydrothermal reaction temperature of 200 ºC and reaction time of 3 h.

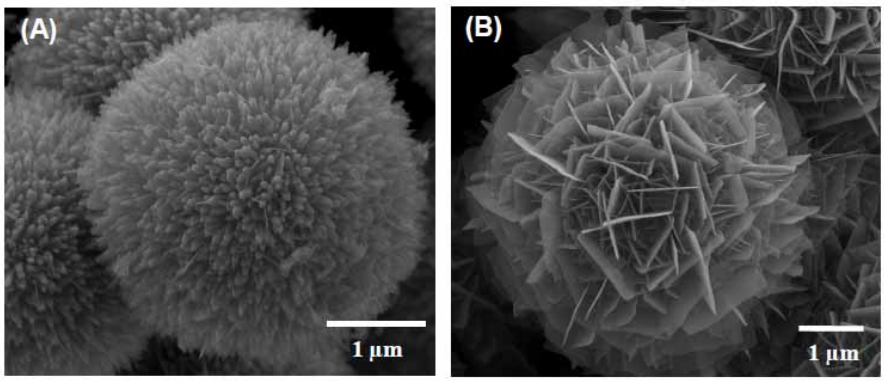

Figure SI-4. (A) and (B) SEM images of the as-synthesised samples obtained at 150 ºC and 180 ºC for 3 h, respectively; $NbCl_5$ concentration of 0.05 M and 40 mL of 1.0% (v/v) HF solution.

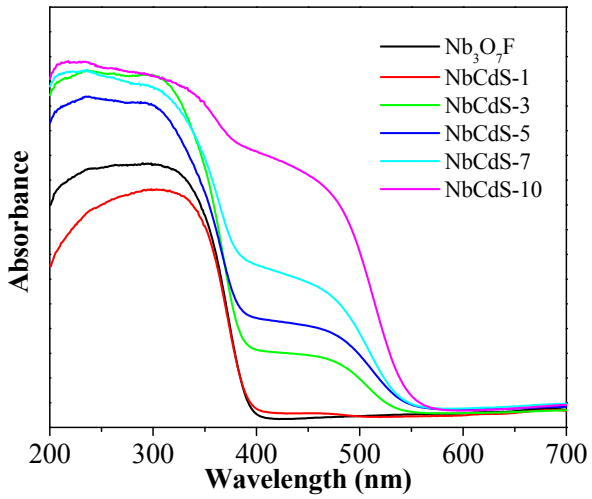

Figure SI-5. UV-vis diffuse reflectance spectra of the Nb_3O_7F film and NbCdS series films with different CBD cycles.

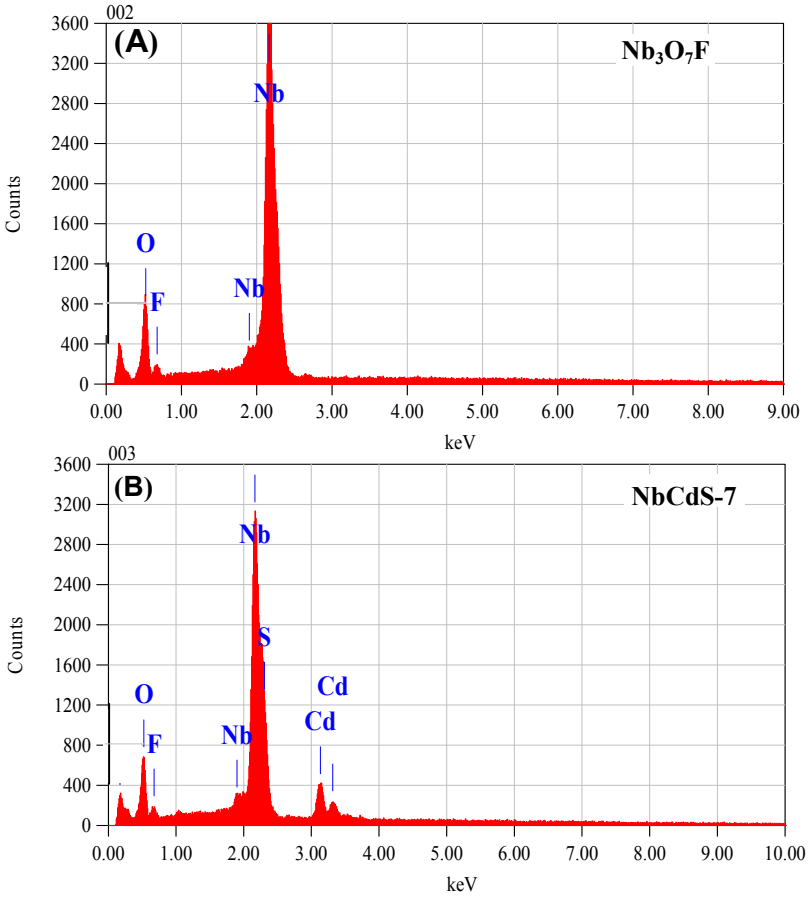

Figure SI-6. Energy dispersive spectroscopy (EDS) of the Nb_3O_7F films before (A) and after (B) CdS sensitisation with 7 CBD cycles.

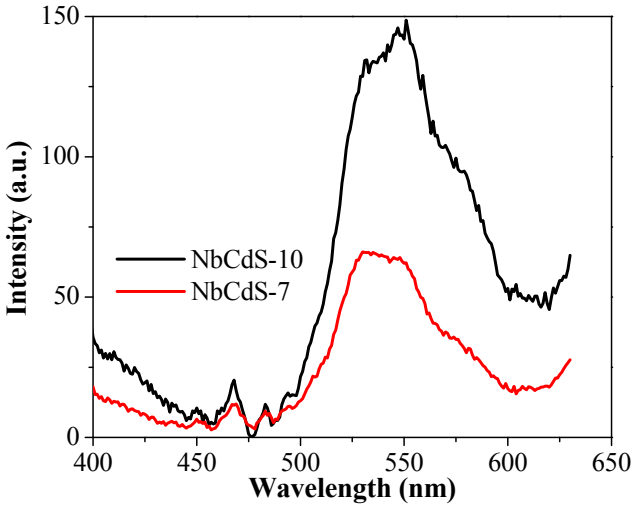

Figure SI-7. PL spectra of the NbCdS-7 and NbCdS-10 photoanodes.

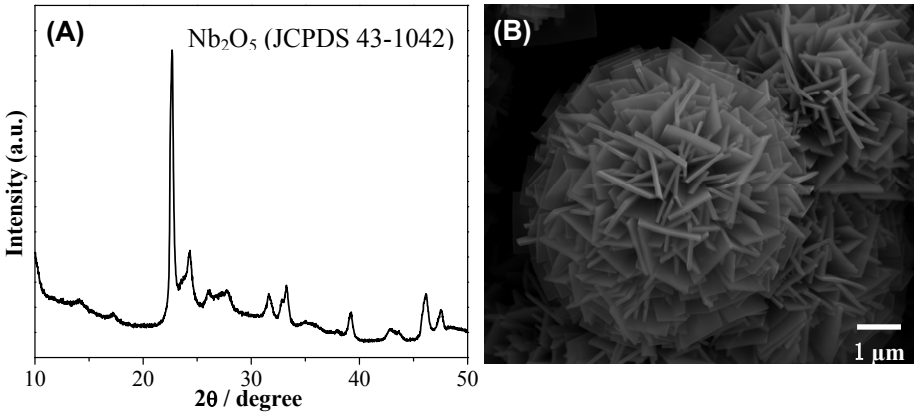

Figure SI-8. (A) XRD pattern of the calcined sample at 550 ºC for 2 h. (B) Surface SEM image of the calcined sample.

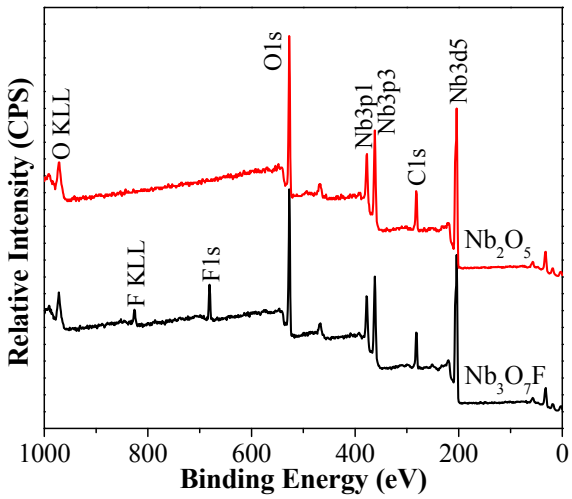

Figure SI-9. XPS survey spectra of the Nb_3O_7F samples before and after calcination at 550 ºC for 2 h.

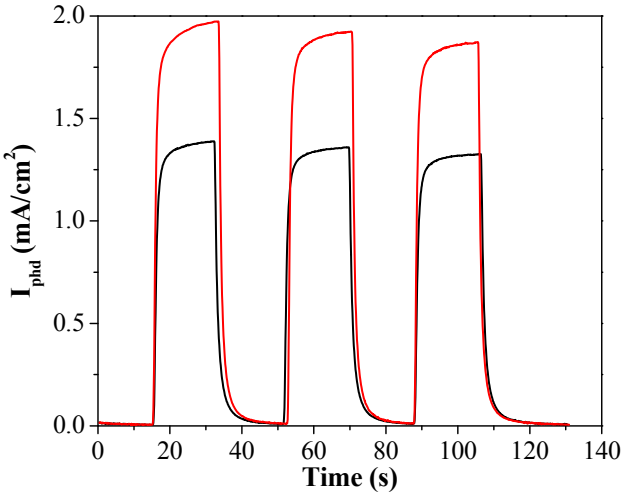

Figure SI-10. Photocurrent versus time measurements of NbCdS-7 (red curve) and Nb_2O_5/CdS-7 (black curve) photoanodes obtained at -0.6 V of applied potential.

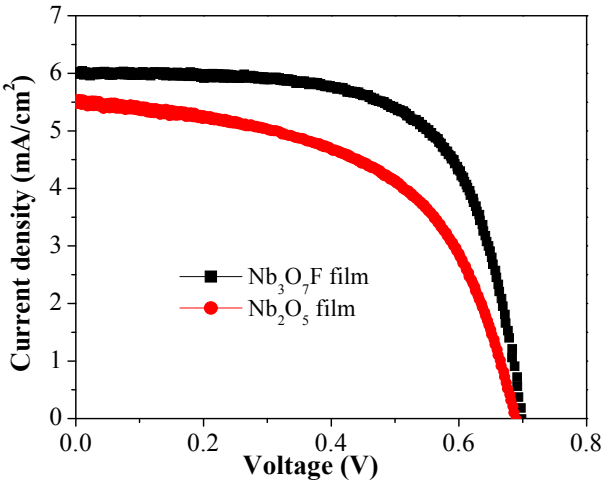

Figure SI-11. Photocurrent as a function of photovoltage for DSSCs assembled with the Nb_3O_7F and Nb_2O_5 nanostructured films.