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Supporting Information

The Impacts of Fluorine-Doped Tin Oxide Photonic Crystals on a Cadmium Sulfide-Based Photoelectrode for Improved Solar Energy Conversion Under Lower Incidence

Kunqiang Wang [1,#], Xi Ke [1,#], Weizhe Wang [1], Chen Tu [2], Dongxiang Luo [1,*] and Menglong Zhang [1,*]

[1] Institute of Semiconductors, South China Normal University, 510631, China; kunqiangwang@m.scnu.edu.cn (K.W.); xike@m.scnu.edu.cn (X.K); weizhewang@m.scnu.edu.cn (W.W)

[2] School of Chemistry, Faculty of Science, Chemistry Building F11, Camperdown 2050, University of Sydney, NSW 2006, Australia; chtu4116@uni.sydney.edu.au (C.T.)

* Correspondence: luodx@gdut.edu.cn (D.L.); mlzhang@m.scnu.edu.cn (M.Z.)

# These authors equally contributed to this work.

PS size Incidence	250 nm	300 nm	350 nm	400 nm	450 nm	500 nm
0º	542 nm	651 nm	759 nm	868 nm	976 nm	1085 nm
15º	535 nm	642 nm	749 nm	856 nm	962 nm	1069 nm
30º	513 nm	615 nm	718 nm	821 nm	925 nm	1026 nm
45º	481 nm	578 nm	674 nm	770 nm	867 nm	963 nm
60º	448 nm	537 nm	627 nm	717 nm	806 nm	896 nm
75º	422 nm	506 nm	590 nm	674 nm	759 nm	843 nm
90º	411 nm	494 nm	576 nm	658 nm	741 nm	823 nm

Table 1. The PSB as a function of PS size and incidence under standard conditions.

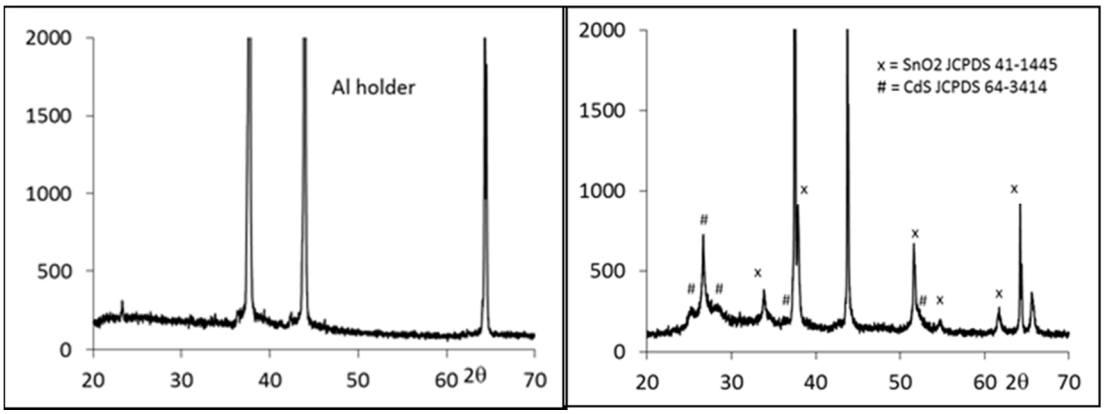

Figure 1. PXRD of the aluminum holder used for the test; b) as-prepared PCs FTO loaded with CdS nanoparticles.

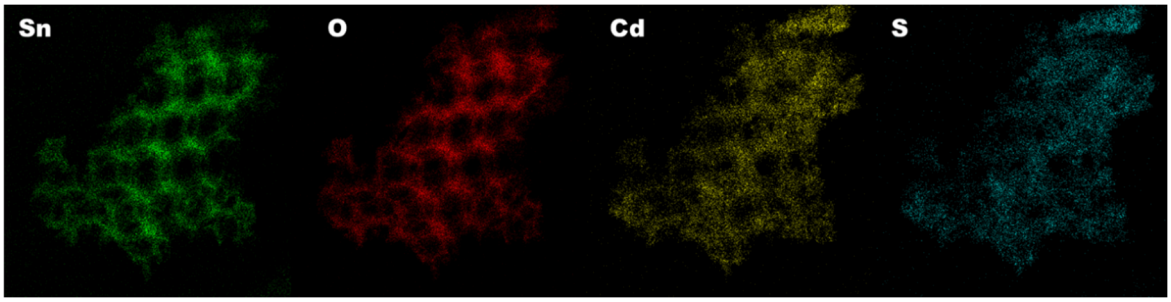

Figure 2. TEM-EDX elemental mapping of the as-prepared PCs FTO loaded with CdS nanoparticles.

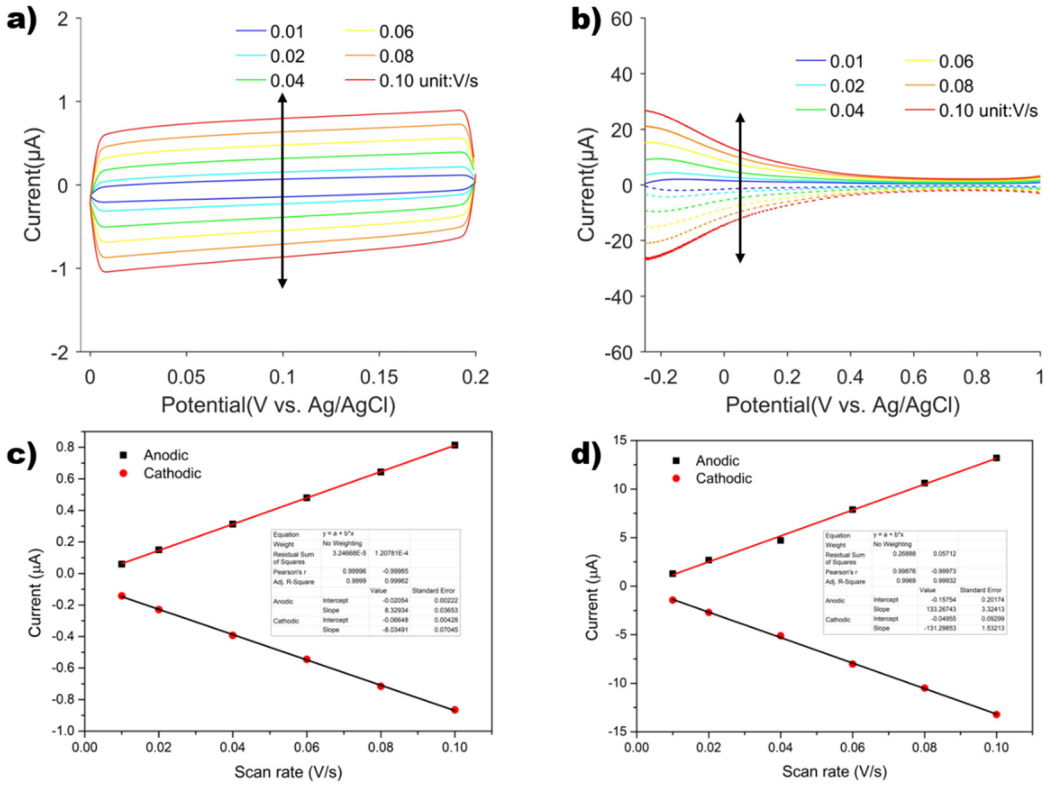

Figure 3. Capacitance measurements of a) planar FTO and b) PCs FTO via cyclic voltammetry. Capacitance is derived from the gradient of current vs. scan rate for c) planar FTO substrate 0V vs. Ag/AgCl and d) PCs FTO at 0.06V vs. Ag/AgCl.

The capacitance for PCs FTO electrode is determined using the following procedure, which can be referred to previous reports.[1] A photoelectrode with geometric area of 1 cm^{-2} is submerged in an electrolyte solution of KCl (1M) using the same standard three-electrode setup as described in experimental section. Each sample is scanned from -0.5 V to +1.0 V and then back to -0.5 V (1 scan) at different scan rate (0.01, 0.02, 0.04, 0.06, 0.08 and 0.10 Vs^{-1}), and repeated for 4 times. The anodic and cathodic currents are averaged for each potential and then subtracted from both the anodic and cathodic scans. This allows correction for faradaic current, giving a more accurate measurement of the capacitance. Current vs. scan rate (Fig. S3c and d) gives a linear correlation and the capacitance derived from the gradient gives planar FTO = 8.33 ɥF and PCs FTO = 133.27 ɥF, revealing a ca. 15.99 times of surface area of PCs FTO in comparison to p-FTO.

[1] J.-Y. Choi, J.-H. Choi, Journal of Industrial and Engineering Chemistry, 16 (2010) 401-405.

[2] E. Gileadi, Electrode Kinetcs for Chemsits, Chemiacal Engineers and Materials Scientists, VCH Publisers (1993),220-224

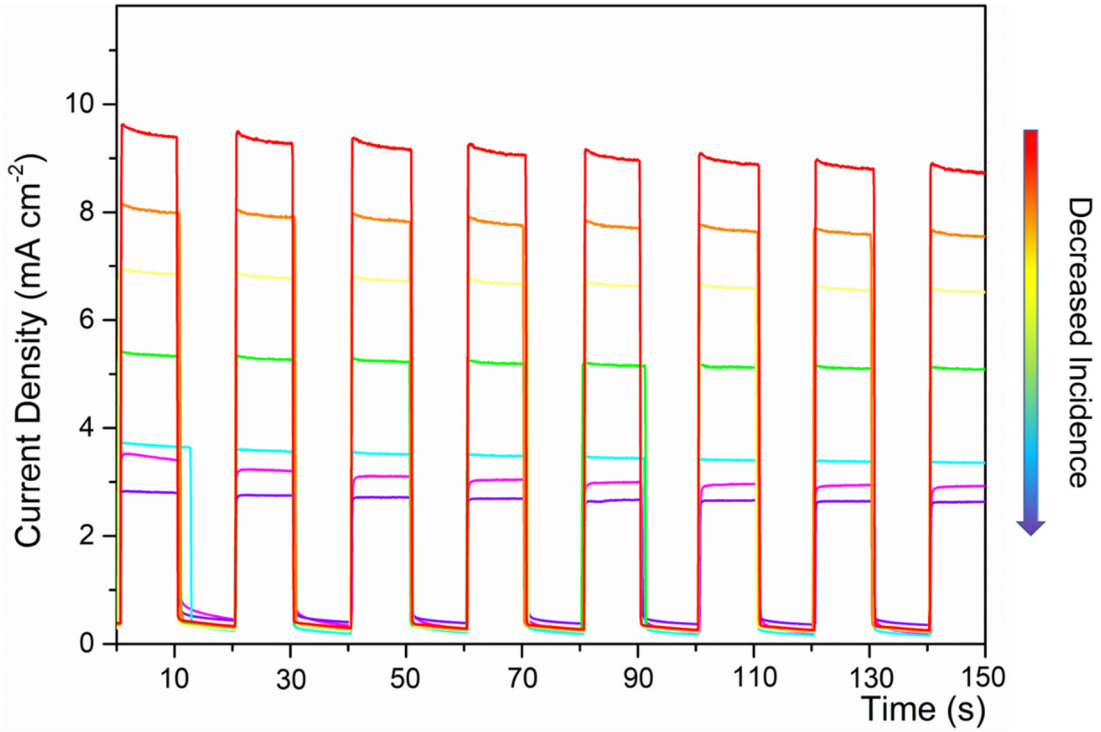

Figure 4. i-t curves of CdS/PCs FTO photoelectrode under different incident illumination, the light source is chopped for every 10 seconds. Conditions: 100 mW cm^{-2} Xe lamp, 0 V vs. $V_{Ag/AgCl}$, in $Na_2SO_{3(aq.)}/Na_2S_{(aq.)}$ (0.35 M/0.25 M).

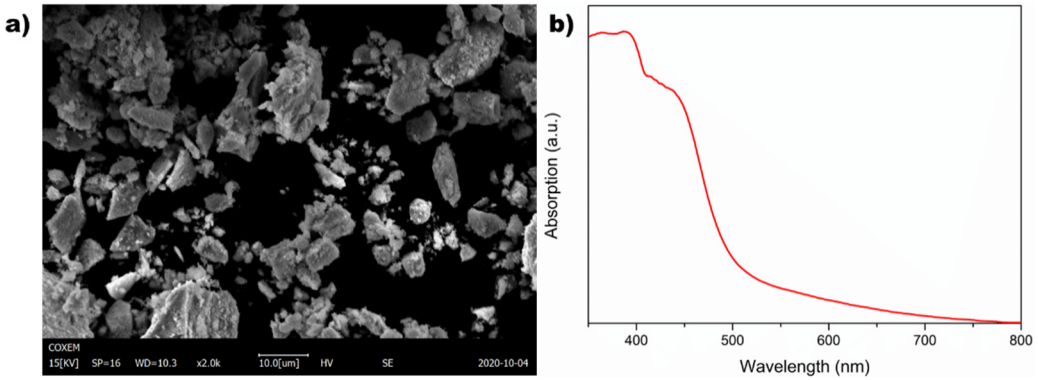

Figure 5. a) SEM image and b) absorption spectra of bulk CdS synthesized using SILAR method in absence of substrate.