Electronic Supplementary Information for

High performance and reduced charge recombination of CdSe/CdS quantum dot-sensitized solar cells

Xiao-Yun Yu, Bing-Xin Lei, Dai-Bin Kuang* and Cheng-Yong Su

X. Y. Yu, Dr. B. X. Lei, Prof. D. B. Kuang, Prof. C. Y. Su

MOE Key Laboratory of Bioinorganic and Synthetic Chemistry, KLGHEI of Environment and Energy Chemistry, State Key Laboratory of Optoelectronic Materials and Technologies, School of Chemistry and Chemical Engineering, Sun Yat-sen University, Guangzhou 510275, P. R. China

E-mail: kuangdb@mail.sysu.edu.cn.

Experiment of thioglycolic acid (TGA) decomposition.

To evaluate the generation of S^{2-} during the hydrothermal reaction at 160 °C, additional experiment has been done in the absence of Cd^{2+} and Na_2SeSO_3 (10 mmol TGA and 8 mmol CH_3COOH was added into 35 ml of water, then the pH value was adjusted to 11 using 10 M NaOH). After hydrothermal reaction at 160 °C for 6 h, the resulting liquid was added into a solution containing 0.1 M Pb^{2+}. Black PbS precipitate was obtained immediately, implying the presence of S^{2-} in the hydrothermal reaction solution, which can be attributed to the decomposition of TGA, the only sulfur source in this experiment. In contrast, if the hydrothermal reaction was performed at 160 °C for 1 h (short time), no precipitate was observed when mixing the obtained solution (hydrothermal 1 h) and Pb^{2+}. Namely, heated within 1 h, TGA molecule didn't decompose. In a word, organic TGA molecule decomposes and releases S^{2-} gradually at 160 °C, leading to the formation of CdS shells onto the CdSe QDs.

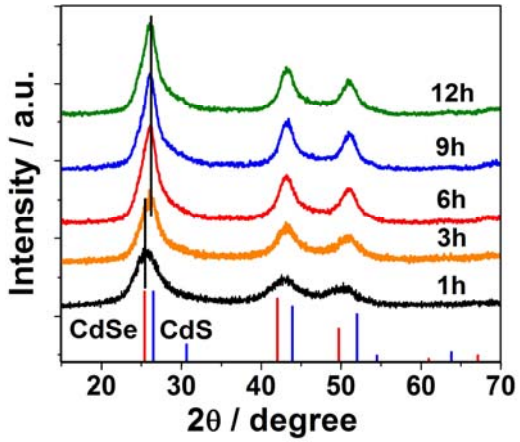

Fig. S1 XRD patterns of the samples prepared at 160 °C for different time.

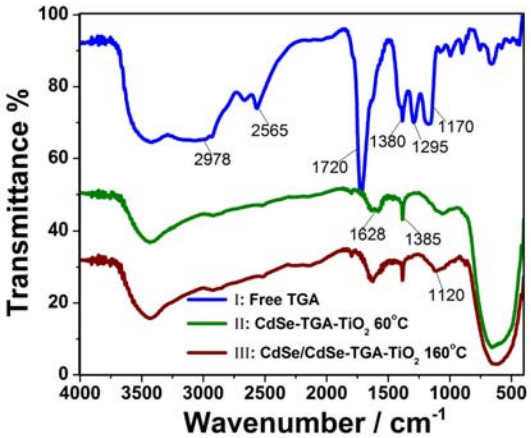

Fig. S2 FTIR spectra of free TGA, CdSe-TGA-TiO_2 (prepared at 60 °C for 6 h) and CdSe/CdS-TGA-TiO_2 (prepared at 160 °C for 6 h).

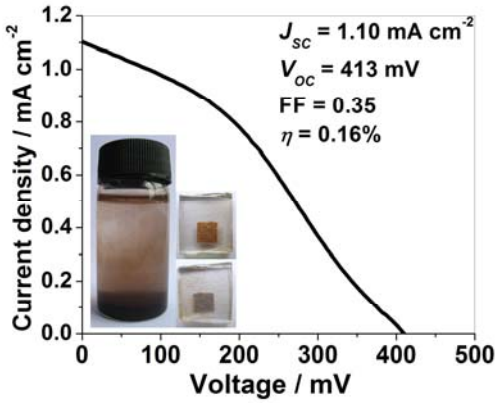

Fig. S3 The *J-V* curve and images (front↑ and back↓ sides) of the TiO_2 film after hydrothermal reaction (160 °C, 6 h) in the absence of TGA, and the CdSe precipitation obtained at the bottom of autoclave.

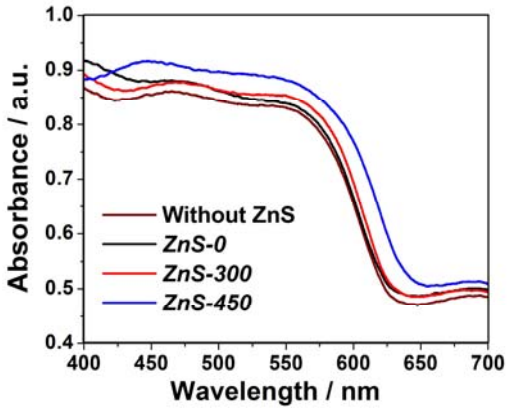

Fig. S4 UV-vis absorption spectra of the photoelectrodes with or without ZnS-capping layer and annealed at 400 °C for different time.

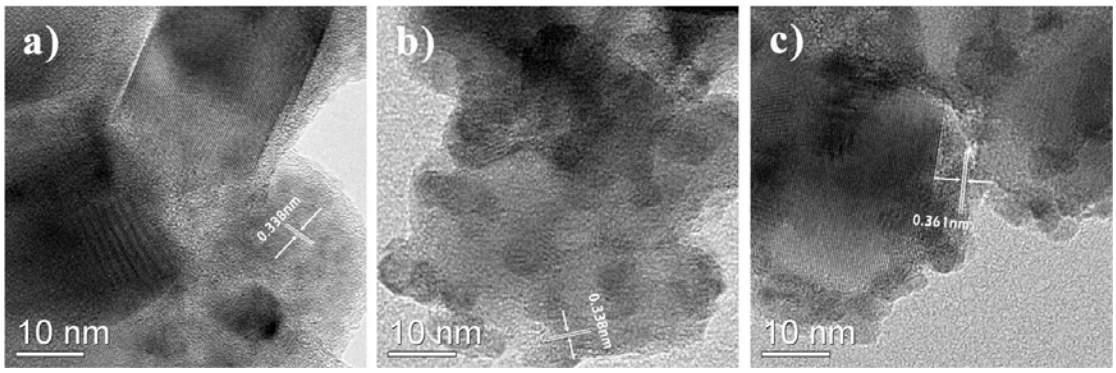

Fig. S5 TEM of TiO_2-CdSe/CdS-ZnS electrodes annealed at 400 °C for (a) 0 s, (b) 300 s, and (c) 450 s.

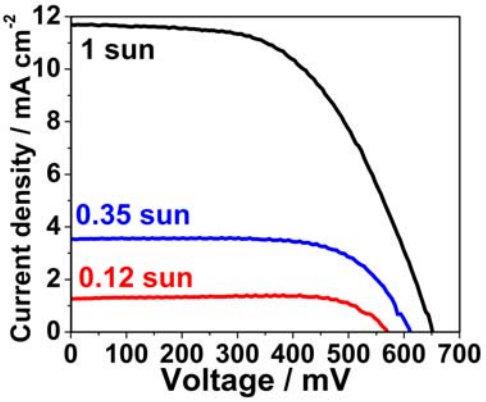

Fig. S6 J-V curves of ZnS-300s QDSSCs (working electrode prepared at 160 °C, capped by ZnS and annealed at 400 °C for 300s) illuminated under different light intensities.

Table S1 Photovoltaic parameters of QDSSCs based onTiO_2-QDs-ZnS photoelectrodes prepared by annealing at 400 °C for 300s.

light density	J_{SC} / mA cm^{-2}	V_{OC} / mV	η / %	FF
1 sun	11.71	654	4.21	0.55
0.35 sun	3.53	611	4.26	0.69
0.12 sun	1.26	570	5.04	0.84