Supplemental Document

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MENG WANG,[1] DEHAI LIANG,[1] WEN MA,[1] QIONGHUA MO,[1] ZHIGANG ZANG,[1] QINGKAI QIAN,[1,2] AND WENSI CAI[1,*]

[1]*Key Laboratory of Optoelectronic Technology and Systems (Ministry of Education), Chongqing University, Chongqing 400044, China*
[2]*e-mail: qqian@cqu.edu.cn*
[*]*Corresponding author: wensi.cai@cqu.edu.cn*

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Significant performance enhancement of UV-Vis self-powered $CsPbBr_3$ quantum dots based photodetectors induced by ligand modification and P3HT embedding: supplemental document

MENG WANG,[1] DEHAI LIANG,[1] WEN MA,[1] QIONGHUA MO,[1] ZHIGANG ZANG,[1] QINGKAI QIAN*,[1,2] AND WENSI CAI*[1,3]

Key Laboratory of Optoelectronic Technology and Systems (Ministry of Education), Chongqing University, Chongqing 400044, China

E-mail: qqian@cqu.edu.cn, wensi.cai@cqu.edu.cn

1. Experimental

The $CsPbBr_3$-DA and $CsPbBr_3$-OA QDs were prepared similar to our previous work [1]. To prepare $CsPbBr_3$:P3HT precursors, P3HT was first dissolved in chlorobenzene to obtain a solution with the concentration of 12 mg/mL. Then P3HT solution was then mixed with $CsPbBr_3$ QDs and stirred at room temperature. The deposition of PDs started with a spin-coating of SnO_2 hydrocolloid dispersion onto ITO/glass substrates at 4000 rpm for 30 s and annealed at 150 °C for 30 min. Then $CsPbBr_3$:P3HT or $CsPbBr_3$ precursors were spin-coated onto the SnO_2, followed by an annealing at 50 °C for 10 min. Finally, MoO_3/Ag electrodes were thermally evaporated through shadow masks.

2. Characterization

The crystal phases of the $CsPbBr_3$ QDs were characterized by X-ray diffraction (XRD) with a Cu Ka radiation (XRD-6100, SHIMADZU, Japan). The transmission electron microscopy (TEM) was recorded by an electron microscope (Libra 200 FE, Zeiss, Germany). Absorption spectra were recorded ranging from 300 to 800 nm by a UV–Vis spectrophotometer (UV–vis: UV-3600, SHIMADZU, Japan). The photoluminescence (PL) spectra were measured by a fluorescence spectrophotometer (Cary Eclipse G9800A). The current-time (*I–t*) characteristics of the PDs were measured by a Keithley 4200SCS semiconductor analyzer, using 375 and 532 nm lasers as the light sources.

3. Results

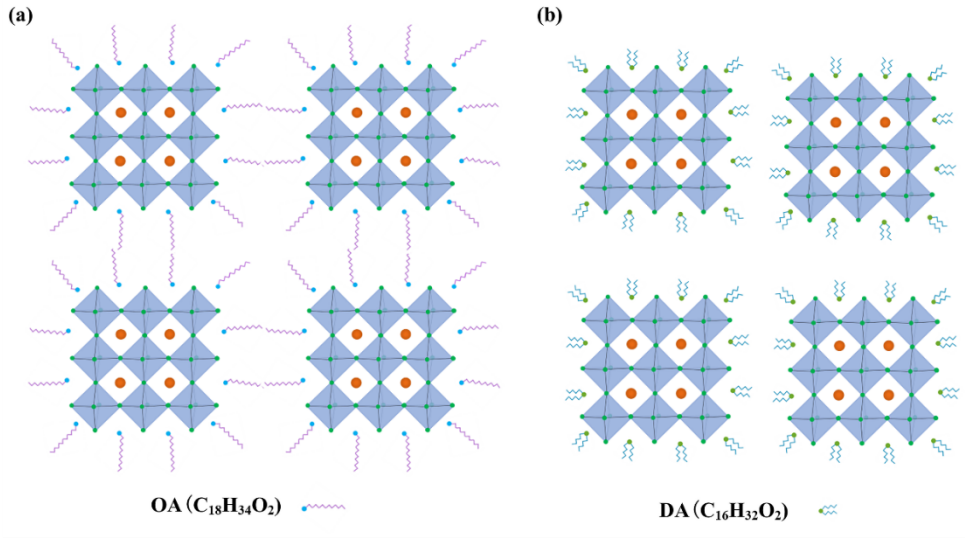

Fig. S1 The schematic illustrations of $CsPbBr_3$ QDs capped with (a) OA and (b) DA ligands.

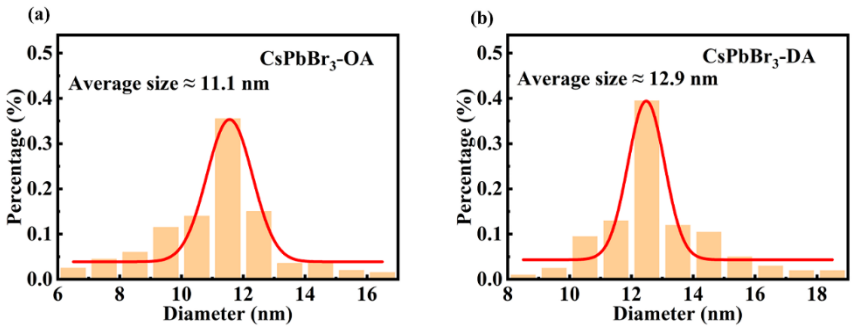

Fig. S2 The size distributions of (a) $CsPbBr_3$-OA and (b) $CsPbBr_3$-DA QDs obtained from TEM results.

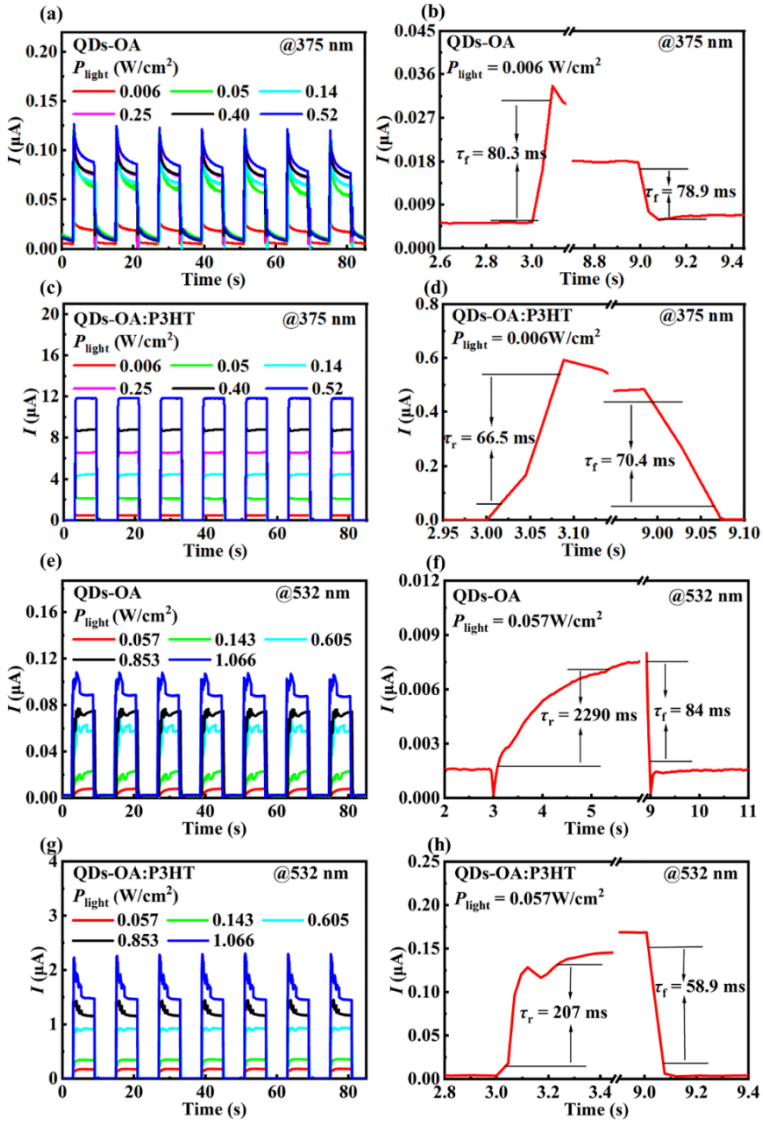

Fig. S3 (a), (c), (e) and (g) *I-t* characteristics of $CsPbBr_3$-OA and $CsPbBr_3$-OA:P3HT PDs under different illumination intensities with a 0 V bias. (b), (d), (f) and (h) Corresponding τ_r and τ_f of each PD.

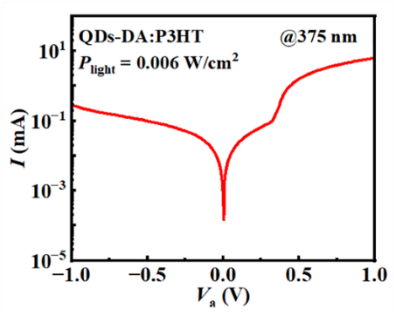

Fig. S4 *I–V* characteristics of a typical $CsPbBr_3$-DA:P3HT PD under a 375 nm laser illumination at a fixed power intensity of 0.006 W/cm^2

Reference

1. D. Yan, T. Shi, Z. Zang, T. Zhou, Z. Liu, Z. Zhang, J. Du, Y. Leng and X. Tang, Small 15, 1901173 (2019).