Supporting information

High-Performance Broadband Photodetectors Based on All-inorganic Perovskite CsPb(Br/I)$_3$ Nanocrystal/CdS-Microwire Heterostructures

Haixia Li,* Weiwei Lin, Liang Ma, Yang Liu, Yu Wang, Ao Li, Xiaorui Jin, and Lun Xiong*

School of Optical Information and Energy Engineering, School of Mathematics and Physics, Wuhan Institute of Technology, Guanggu 1st Road 206, Wuhan 430205, P. R. China.

*Corresponding author: Haixia Li: lihaixia@wit.edu.cn, Lun Xiong: xionglun@wit.edu.cn

Figure S1: Energy-dispersive spectroscopy (EDS) analysis was used to assess of the fabricated CsPb(Br/I)$_3$ NC/CdS MW heterostructure.

Figure S2: The high-resolution XPS spectra of Cs-3d, Pb-4f, Br-3d, and I-3d in CsPb(Br/I)$_3$ NCs were observed at 725.55, 136.15, 69.90, and 619.95 eV, respectively.
Figure S3: The individual spectra of (a): CdS MWs, (b): CsPb(Br/I)₃ NCs, (c): CsPb(Br/I)₃ NC/CdS MW-hybrid structures, (d) The magnified view of the PL spectra of CsPb(Br/I)₃ NCs.

Table S1: The parameters (R, EQE, D*) for the CsPb(Br/I)₃-NC/CdS-MW- and CdS-MW-based photodetectors under illumination of 365 nm (the applied bias = 5 V).

|        | I_{on}/I_{off} | Rise/decay time | R(A/W) | EQE     | D* (Jones) |
|--------|----------------|-----------------|--------|---------|------------|
| CdS    | 1.75×10³       | 0.2 s/0.2 s     | 6.28   | 2137%   | 3.93×10¹⁰ |
| CdS/CsPb(Br/I)₃ | 3.93×10³       | <0.1 s/<0.1 s   | 14.07  | 4789%   | 8.81×10¹⁰ |

Table S2: The parameters (R, EQE, D*) for the CsPb(Br/I)₃-NC/CdS-MW- and CdS-MW-based photodetectors under illumination of 530 nm (the applied bias = 5 V).

|        | I_{on}/I_{off} | Rise/decay time | R(A/W) | EQE     | D* (Jones) |
|--------|----------------|-----------------|--------|---------|------------|
| CdS    | 4.78×10²       | 0.2 s/0.2 s     | 2.29   | 537%    | 1.43×10¹⁰ |
| CdS/CsPb(Br/I)₃ | 1.9×10³       | <0.1 s/<0.1 s   | 9.11   | 2136%   | 5.71×10¹⁰ |

Table S3: The parameters (R, EQE, D*) for the CsPb(Br/I)₃-NC/CdS-MW- and CdS-MW-based photodetectors under illumination of 660 nm (the applied bias = 5 V).

|        | I_{on}/I_{off} | Rise/decay time | R(A/W) | EQE     | D* (Jones) |
|--------|----------------|-----------------|--------|---------|------------|
| CdS    | 2.4×10²        | 0.2 s/0.2 s     | 0.73   | 137%    | 4.57×10⁹  |
| CdS/CsPb(Br/I)₃ | 1.1×10³       | 0.1 s/0.1 s     | 3.36   | 632%    | 2.11×10¹⁰ |
Table S4: The parameters (R, EQE, D*) for the CsPb(Br/I)$_3$-NC/CdS-MW- and CdS-MW-based photodetectors under illumination of 760 nm (the applied bias = 5 V).

| I$_{on}$/I$_{off}$ | Rise/decay time | R(A/W) | EQE | D* (Jones) |
|-------------------|-----------------|--------|-----|------------|
| CdS               | 54              | 0.3 s/0.3 s | 0.125 | 20% | 7.80×10$^8$ |
| CdS/CsPb(Br/I)$_3$ | 189             | 0.1 s/0.1 s | 0.436 | 71% | 2.73×10$^9$ |

Table S5: The parameters (R, EQE, D*) for the CsPb(Br/I)$_3$-NC/CdS-MW- and CdS-MW-based photodetectors under illumination of 810 nm (the applied bias = 5 V).

| I$_{on}$/I$_{off}$ | Rise/decay time | R(A/W) | EQE | D* (Jones) |
|-------------------|-----------------|--------|-----|------------|
| CdS               | 16              | 0.3 s/0.3 s | 0.233 | 36% | 1.46×10$^9$ |
| CdS/CsPb(Br/I)$_3$ | 41              | 0.1 s/0.1 s | 0.597 | 91% | 3.74×10$^9$ |