Electronic Supplementary Material (ESI) for Nanoscale.

Electronic Supplementary Information

Water-Stable Perovskite $CsPb_2Br_5$/CdSe Quantum Dots Based Photoelectrochemical Sensors for the Sensitive Determination of Dopamine

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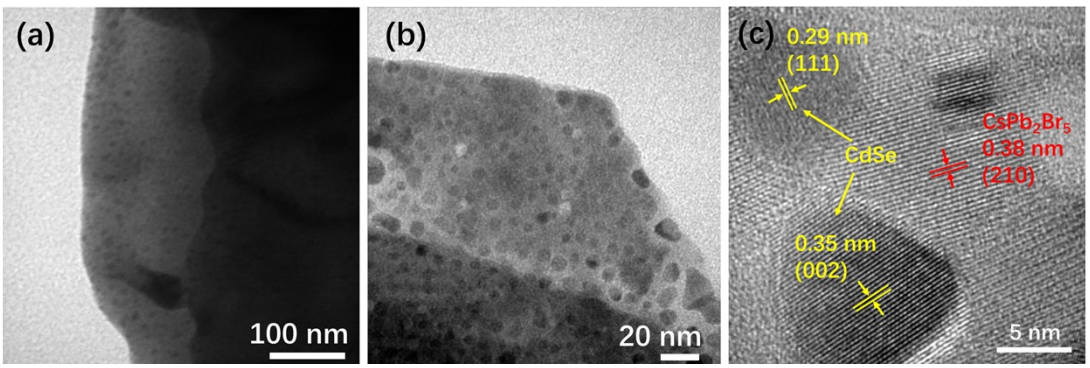

Figure S1: (a-c) The TEM image of the $CsPb_2Br_5$/CdSe heterojunction.

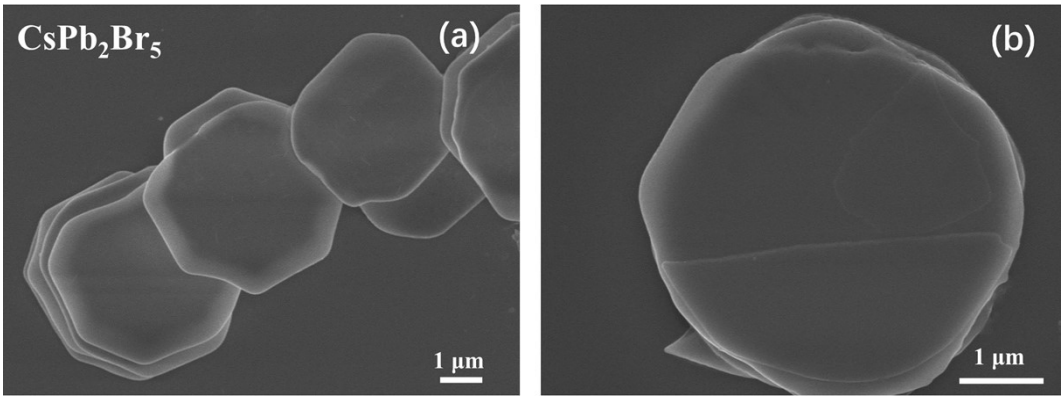

Figure S2: (a-b) The SEM image of the perovskite $CsPb_2Br_5$.

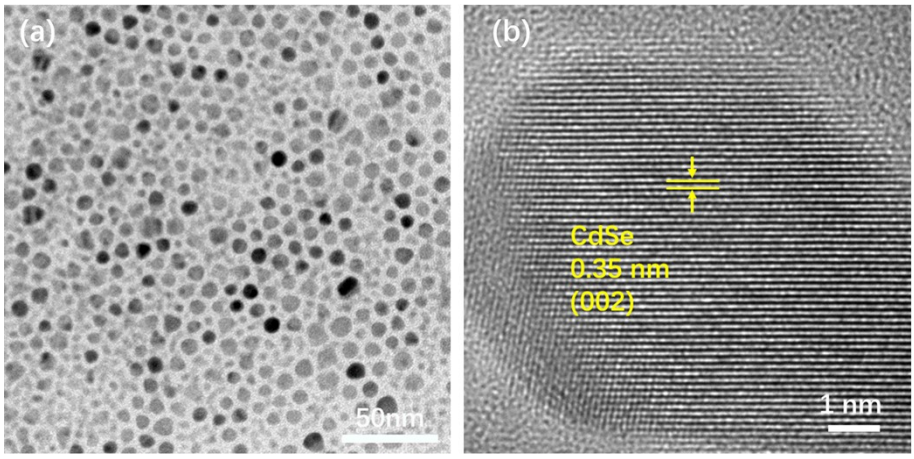

Figure S3: (a-b) The TEM image of CdSe quantum dots.

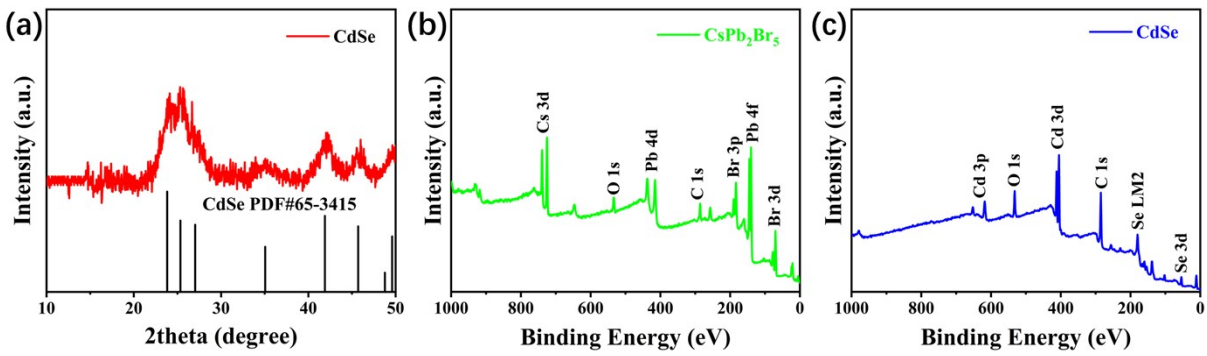

Figure S4: (a) XRD pattern of CdSe. X-ray Photoelectron Spectroscopy (XPS) spectrum of (b) $CsPb_2Br_5$ and (c) CdSe.

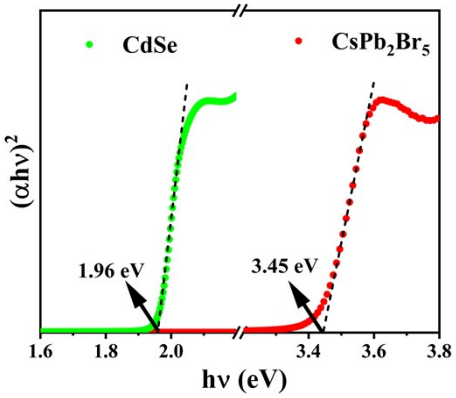

Figure S5: Tauc plots for $CsPb_2Br_5$ and CdSe to determine their optical band gaps.

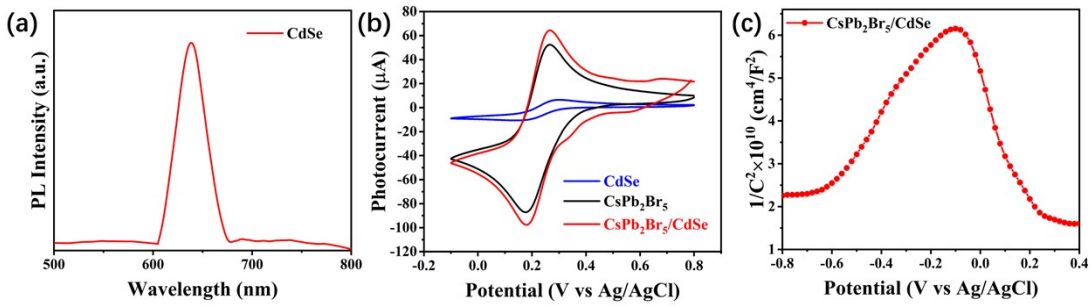

Figure S6: (a) PL spectrum of CdSe. (b) Cyclic voltammograms (CV) of CdSe, $CsPb_2Br_5$, and $CsPb_2Br_5$/CdSe in 0.1 M KCl solution containing 0.5 mM $[Fe(CN)_6]^{3-/4-}$. (c) Mott-Schottky plot of the $CsPb_2Br_5$/CdSe heterostructures.

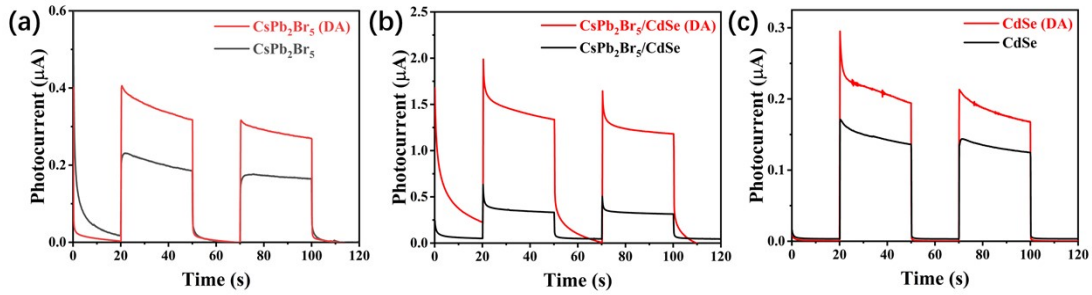

Figure S7: In the presence or absence of dopamine, the photocurrent responses of (a) $CsPb_2Br_5$, (b) $CsPb_2Br_5$/CdSe, and (c) CdSe were measured in PBS solution.

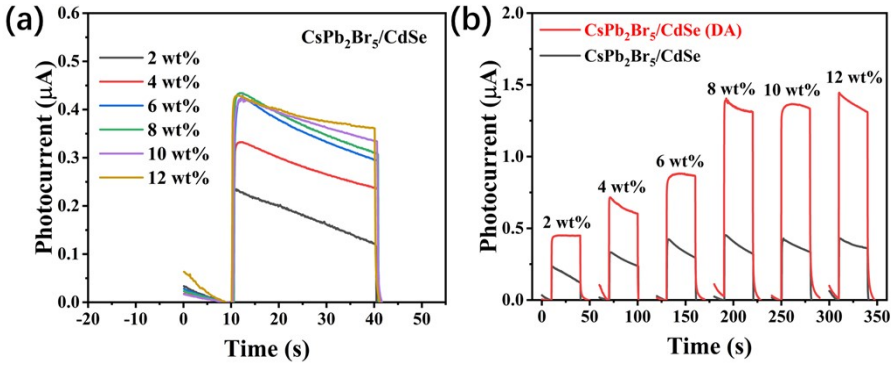

Figure S8: (a) Photocurrent responses of $CsPb_2Br_5$/CdSe heterojunctions with CdSe mass fractions of 2 wt%, 4 wt%, 6 wt%, 8 wt%, 10 wt%, and 12 wt%. (b) Photocurrent responses of a series of $CsPb_2Br_5$/CdSe sensors in PBS with or without dopamine.

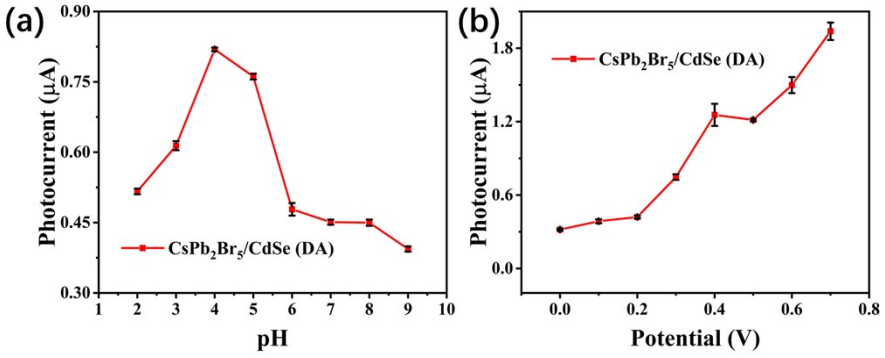

Figure S9: The electrode modified with $CsPb_2Br_5$/CdSe was tested in PBS solution containing dopamine to investigate the effects of (a) pH and (b) applied bias voltage.

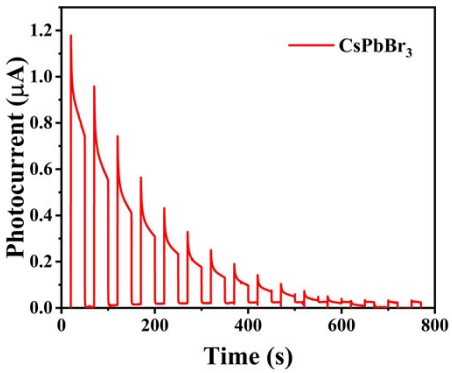

Figure S10: Photocurrent response of the $CsPbBr_3$ photoelectrode.

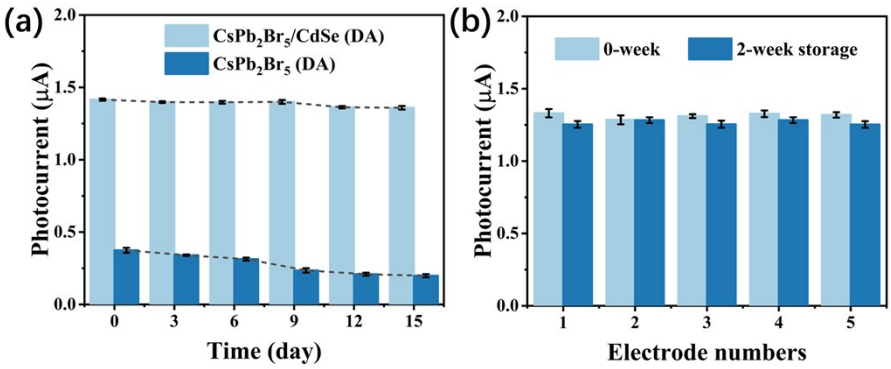

Figure S11: (a) Photocurrent evolutions of the $CsPb_2Br_5$/CdSe and $CsPb_2Br_5$ sensors stored for 15 days. (b) PEC response of the $CsPb_2Br_5$/CdSe sensors for 2-weeks storage.

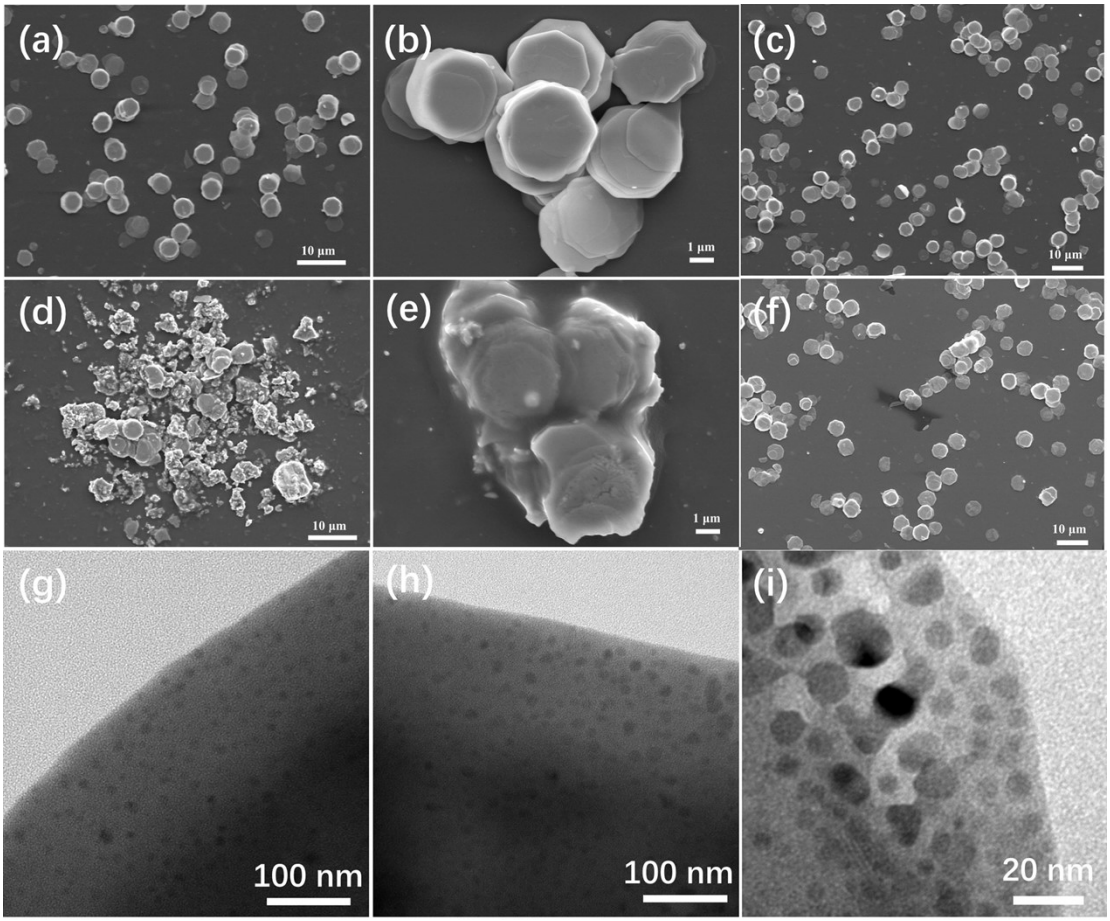

Figure S12: The SEM image of the perovskite $CsPb_2Br_5$ (a-b) before and (d-e) after staying in DA aqueous solution. The SEM images of the $CsPb_2Br_5$/CdSe heterojunction (c) before and (f) after staying in DA aqueous solution. (g-i) The TEM images of the $CsPb_2Br_5$/CdSe heterojunction after exposure to the DA environment.

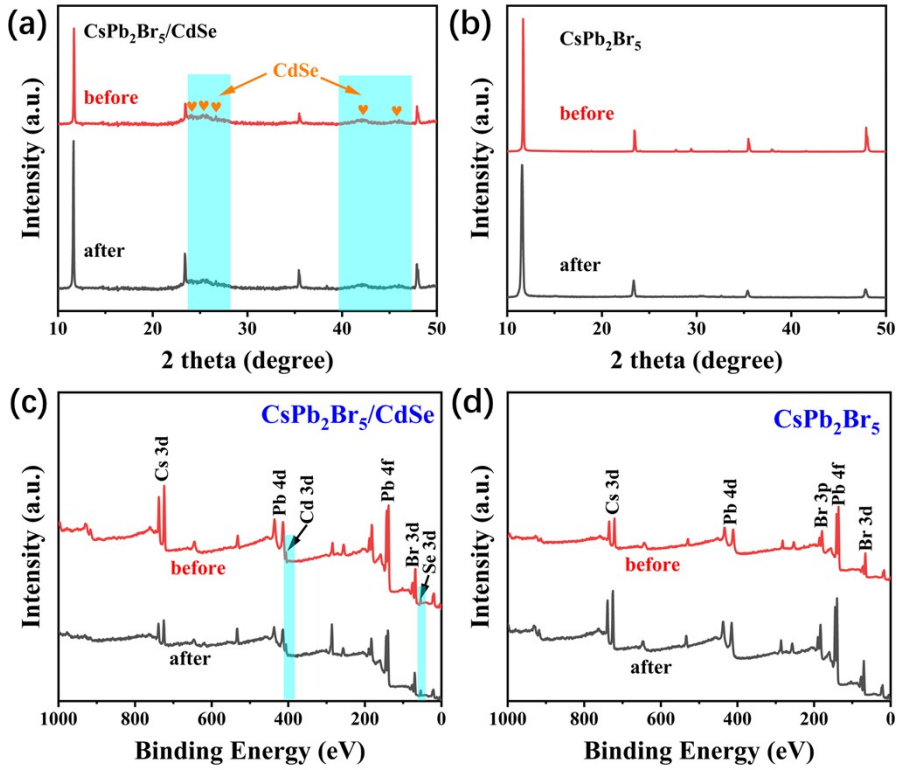

Figure S13: XRD pattern of (a) the $CsPb_2Br_5$/CdSe heterojunction and (b) the perovskite $CsPb_2Br_5$ before/after staying in DA aqueous solution. XPS spectrum of (c) the $CsPb_2Br_5$/CdSe heterojunction and (d) the perovskite $CsPb_2Br_5$ before/after exposure to the DA environment.

Table S1: Comparison of different sensors for dopamine detection.

Method	Linear range (μM)	LOD (μM)	References
PEC	0.1-250	0.012	[1]
PEC	0.3-750	0.022	[2]
PEC	5-200 and 200-5000	2	[3]
PEC	0.05-20	0.016	[4]
PEC	0.5-20 and 20-4000	0.15	[5]
DPV	1-200	0.6	[6]
DPV	1-500	0.22	[2]
DPV	0.5-78	0.11	[7]
CV	0-2000	4.7	[8]
CV	1-90 and 110-350	0.03	[9]
CV	0.05-35	0.04	[10]
PL	0-340	3.6	[11]
PL	10-200 and 500-5000	0.022	[12]
PL	0.1-50	0.01	[13]
SWV	0.001-1000	0.00033	[14]
SWV	10-180	25.4	[15]
SWV	62.5-603	33.3	[16]
PEC	0.4-303.9	0.0124	This work

Table S2: Detection of dopamine in human serum by $CsPb_2Br_5$/CdSe sensor.

No.	Added (μM)	Found (μM)	Recovery (%)	RSD (%, n=3)
1	1	0.92	92.0	2.3
2	5	4.69	93.8	1.6
3	20	20.62	103.1	3.0
4	50	47.52	95.04	3.6
5	200	200.9	100.45	1.3

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