

Supporting Information

Figure S1 (a) Typical top-view and (b) side-view of CdS NRs, (c,d) the EDS elemental analysis spectrum and the corresponding elemental mapping images of Cd and S, respectively.

Figure S2 (a) UV-vis absorbance spectra of CdS, CdS/PDA and CdS/PDA/Co-Pi photoanodes. (b) Tauc plots calculated from (a).

Figure S3 (a) Current density-time (I-T) curves measured at 0.28 V vs RHE under simulated sunlight illumination. (b) EIS curves of CdS and CdS/*x*PDA (*x*= 1, 2, 3, 4 h) photoanodes. (c) Bulk and (d) surface charge separation efficiency of photoanodes

Figure S4 Element distribution mapping of CdS/PDA/Co-Pi

Figure S5 (a) Current density-time (I-T) curves measured at 0.28 V vs RHE under simulated sunlight illumination. (b) EIS curves of CdS and CdS/1PDA/*x*Co-Pi (*x*= 2.5, 5, 7.5, 10 min) photoanodes.

Figure S6 Incident photon to current conversion efficiency (IPCE) spectra for CdS, CdS/1PDA, and CdS/1PDA/5Co-Pi photoanodes at 0.28 V vs. RHE under AM 1.5-irradiation.

Figure S7 Schematic of proposed mechanism for the polymerization of dopamine.

Figure S8 The equivalent circuit of electrochemical impedance spectroscopy.

Table S1 EIS fitted parameters extracted from Nyquist plots of CdS and CdS/1PDA photoanodes.

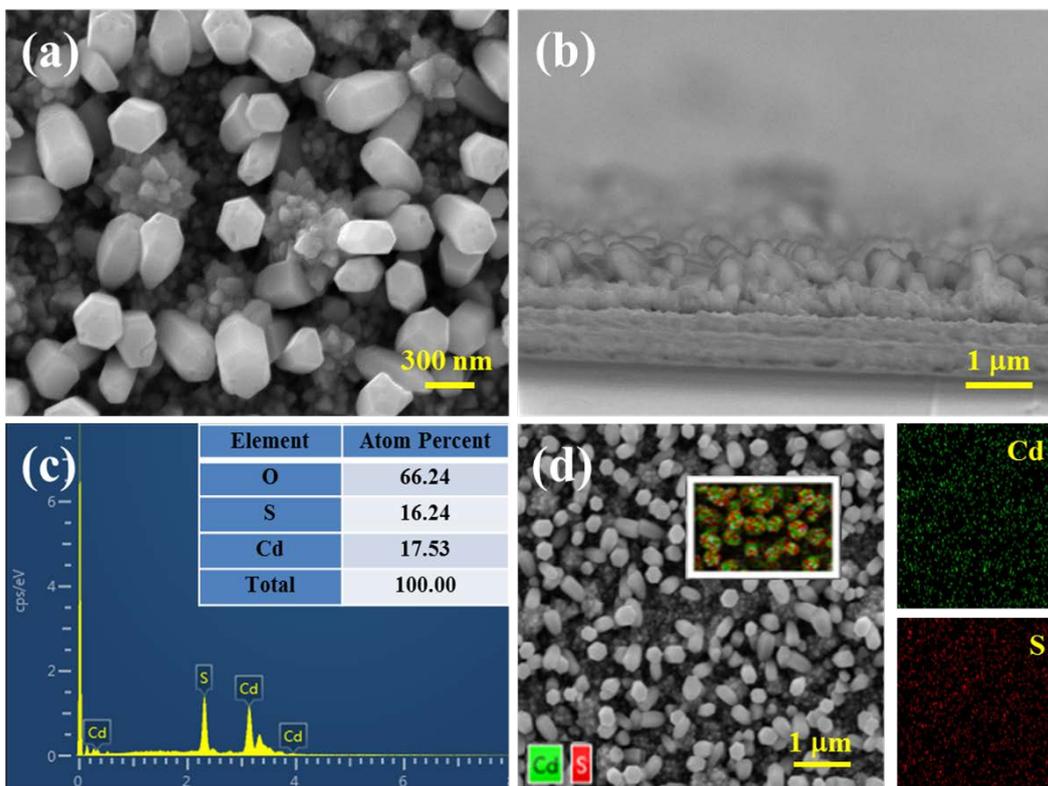


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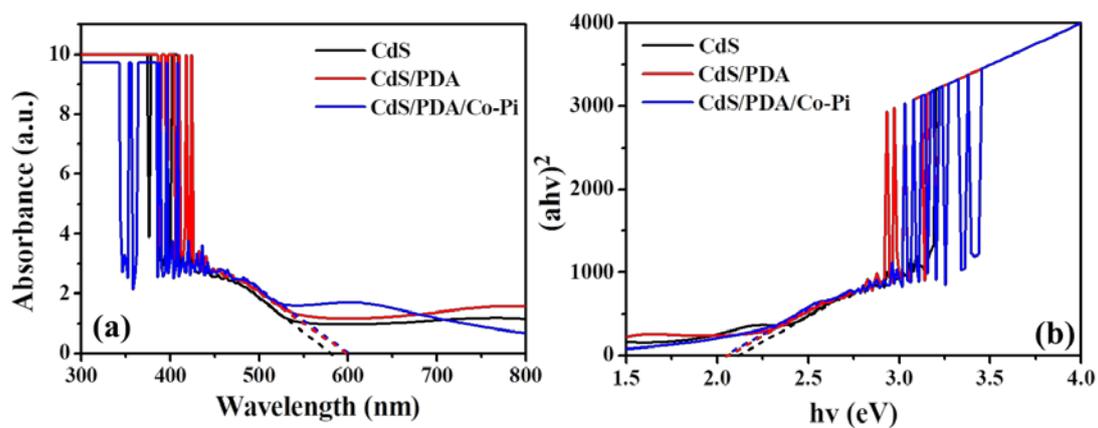


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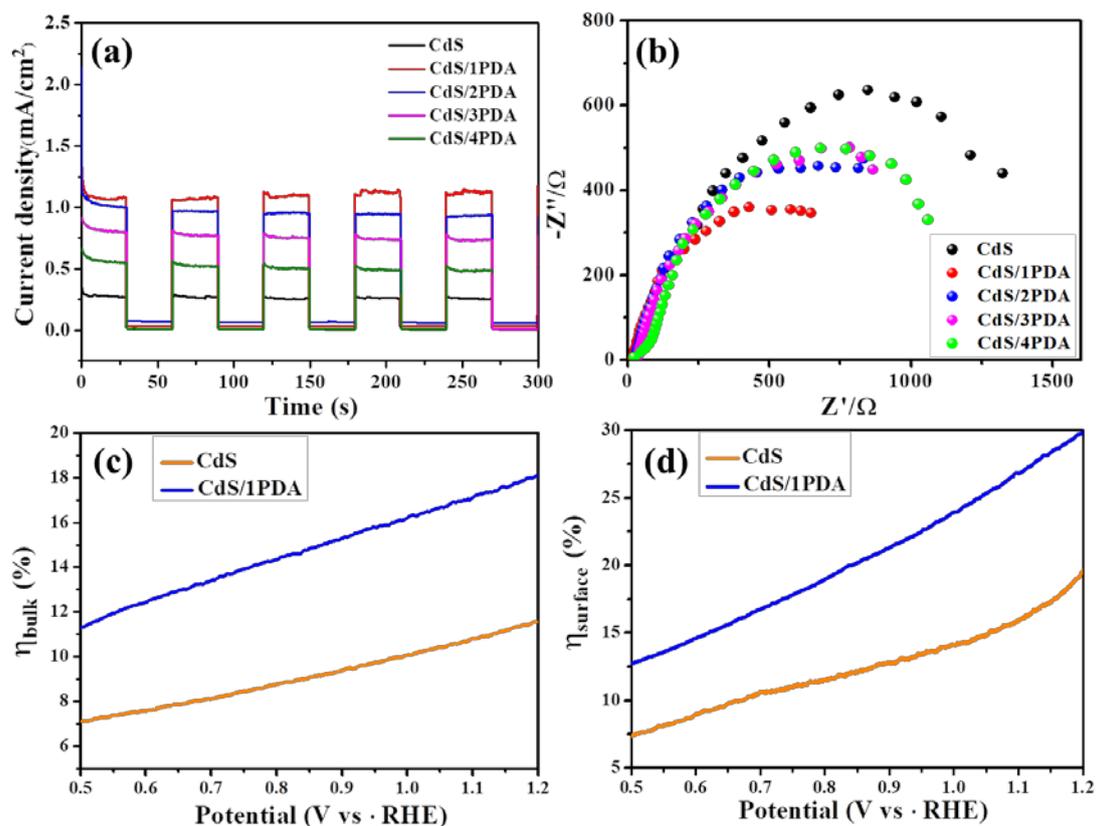


Figure S3 (a) Current density-time (I-T) curves measured at 0.28 V vs RHE under simulated sunlight illumination. (b) EIS curves of CdS and CdS/xPDA ($x= 1, 2, 3, 4$ h) photoanodes. (c) Bulk and (d) surface charge separation efficiency of photoanodes

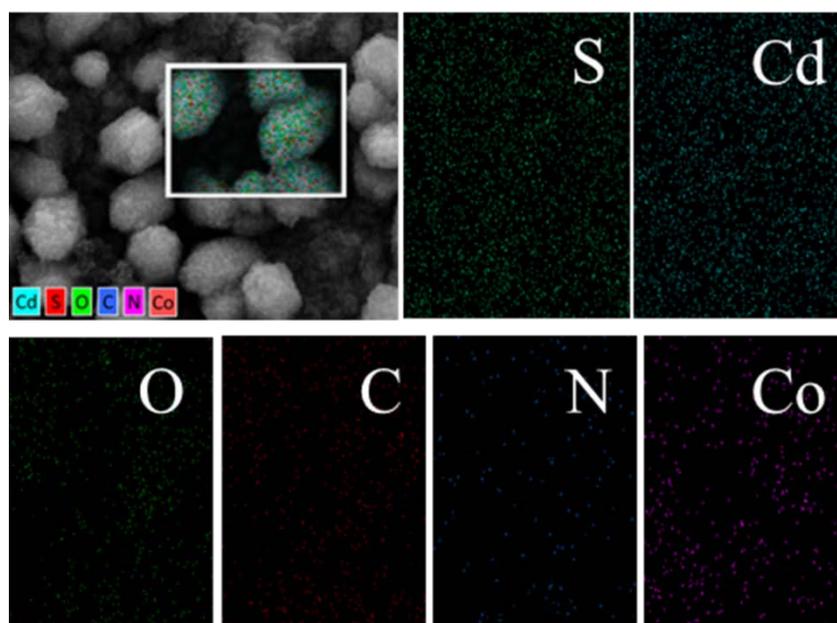


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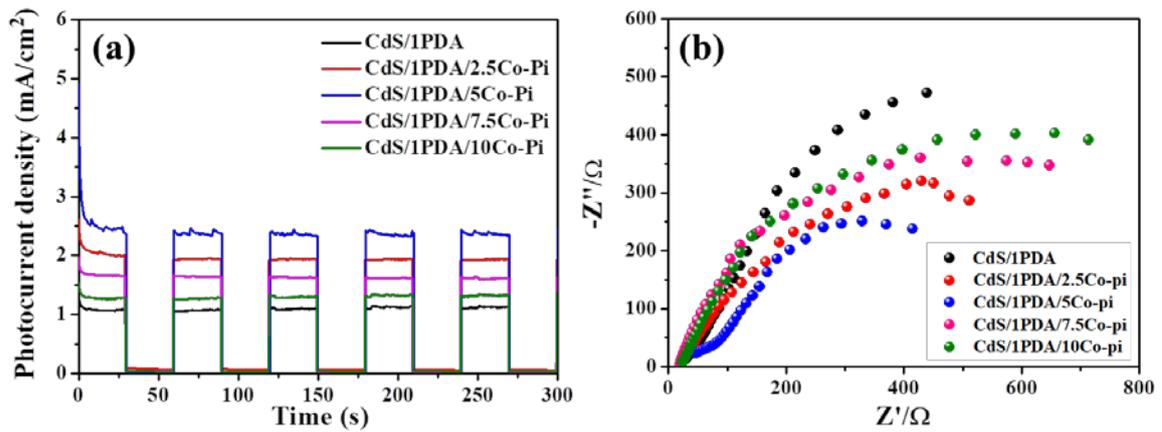


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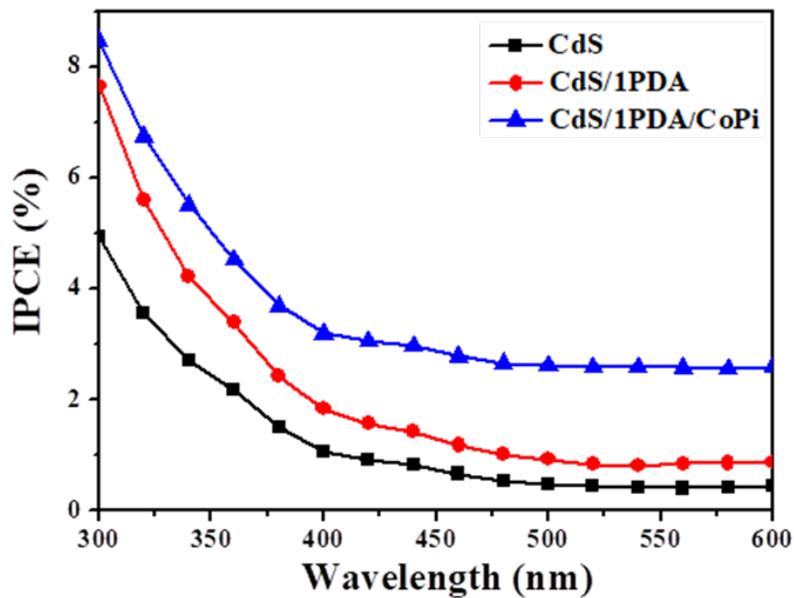


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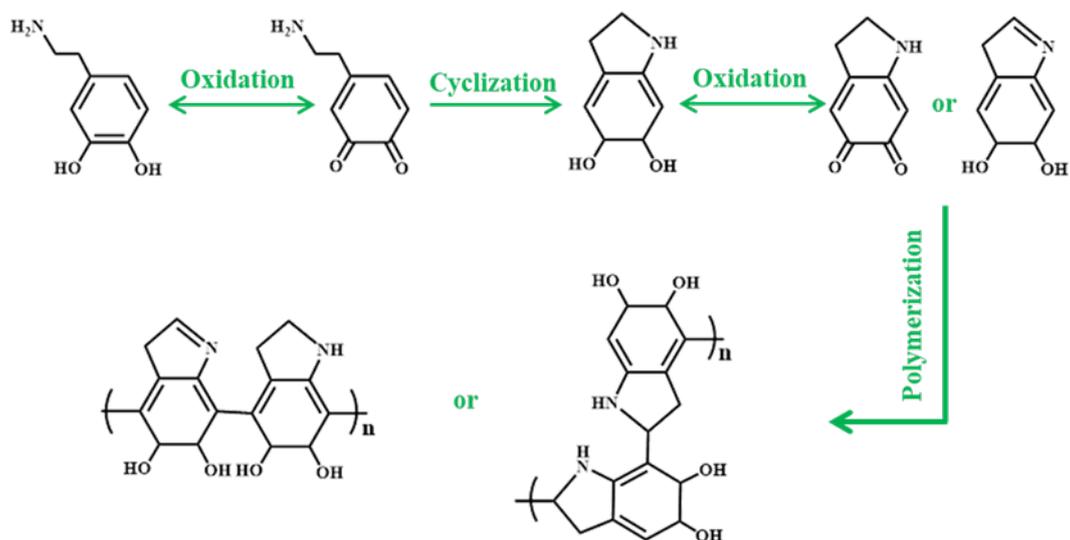


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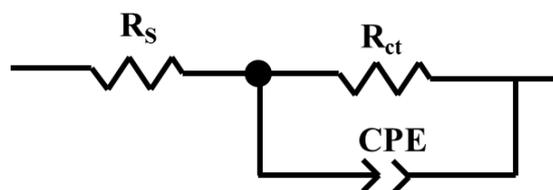


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Sample	R_s ($\Omega \text{ cm}^2$)	R_{ct} ($\Omega \text{ cm}^2$)	CPE (F/cm^2)
CdS	23	3359	5.77×10^{-5}
CdS/1PDA	19	3063	6.62×10^{-5}