

## Supporting Information

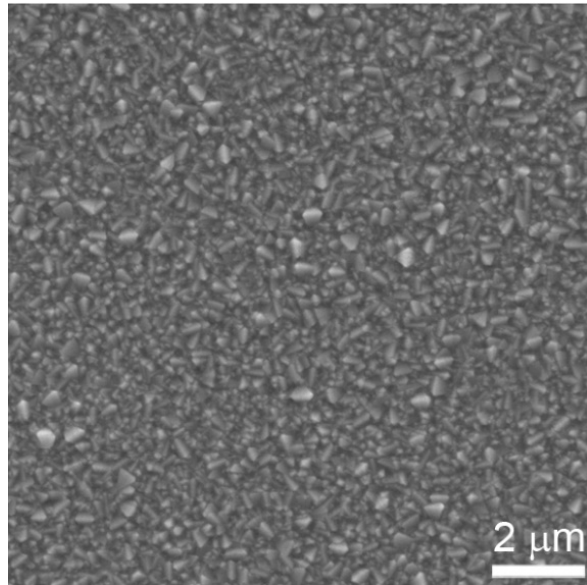
### **In-Situ, Seed-Free Formation of Ruddlesden–Popper Perovskite Cs<sub>2</sub>PbI<sub>2</sub>Cl<sub>2</sub> Nanowires/PbI<sub>2</sub> Heterojunction for High-Responsivity, Self-Powered Photodetector**

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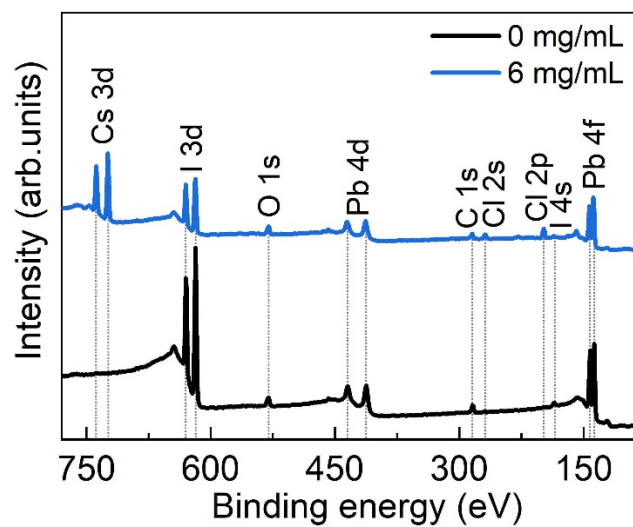
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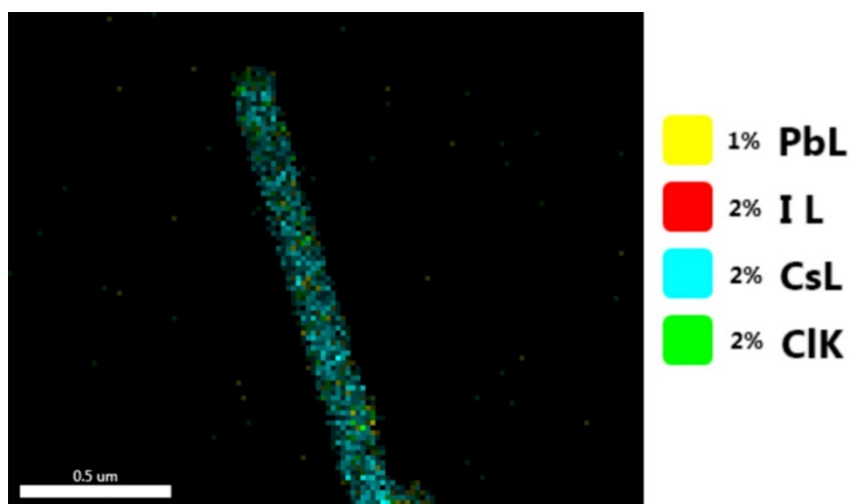
<sup>#</sup>The authors contribute equally to this work.



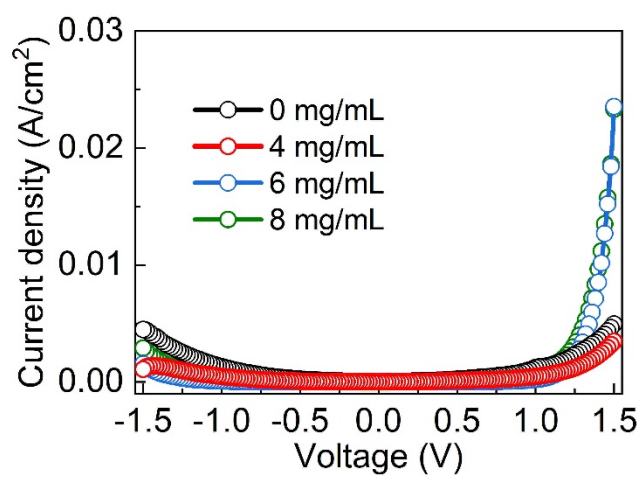
**Figure S1.** Surficial SEM image of FTO/TiO<sub>2</sub> substrate.



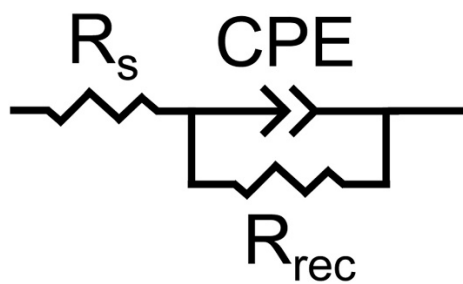
**Figure S2.** XPS survey spectra of PbI<sub>2</sub> film and Cs<sub>2</sub>PbI<sub>2</sub>Cl<sub>2</sub> nanowires/PbI<sub>2</sub> heterojunction obtained with 6 mg/mL CsCl/MeOH.



**Figure S3.** EDS mapping image of a  $\text{Cs}_2\text{PbI}_2\text{Cl}_2$  nanowire.



**Figure S4.** Linear-scale dark J-V curves of self-powered PDs fabricated with pristine  $\text{PbI}_2$  film and  $\text{Cs}_2\text{PbI}_2\text{Cl}_2$  nanowires/ $\text{PbI}_2$  heterojunctions formed with 4, 6, and 8 mg/mL CsCl/MeOH.



**Figure S5.** Equivalent circuit model for fitting the EIS Nyquist curves of self-powered PDs fabricated with pristine  $\text{PbI}_2$  film and  $\text{Cs}_2\text{PbI}_2\text{Cl}_2$  nanowires/ $\text{PbI}_2$  heterojunction produced with 6 mg/mL  $\text{CsCl}/\text{MeOH}$ .