Supporting Information

# Enhanced Sensitivity in Self-Powered Dion-Jacobson Perovskite X-ray Detectors via a Ternary-Solvent-Ink Approach

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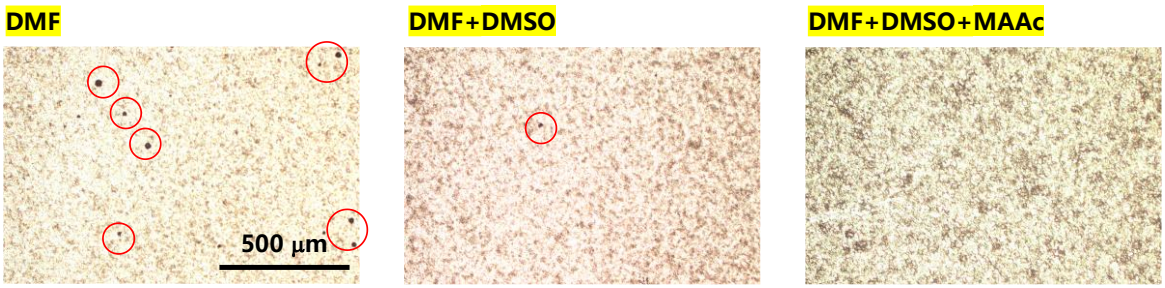


Figure S1. Optical microscope images of quasi-2D DJ perovskite films made by with single, binary, and ternary solvents.

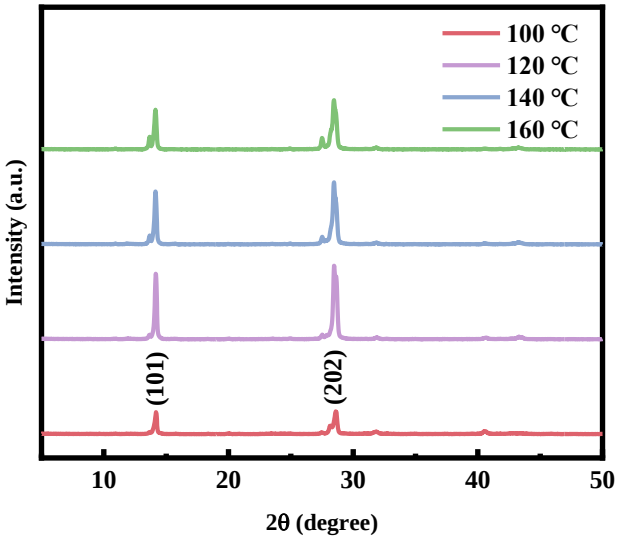


Figure S2. The XRD pattern of quasi-2D films made by ternary solvent ink strategy under different processing temperatures.

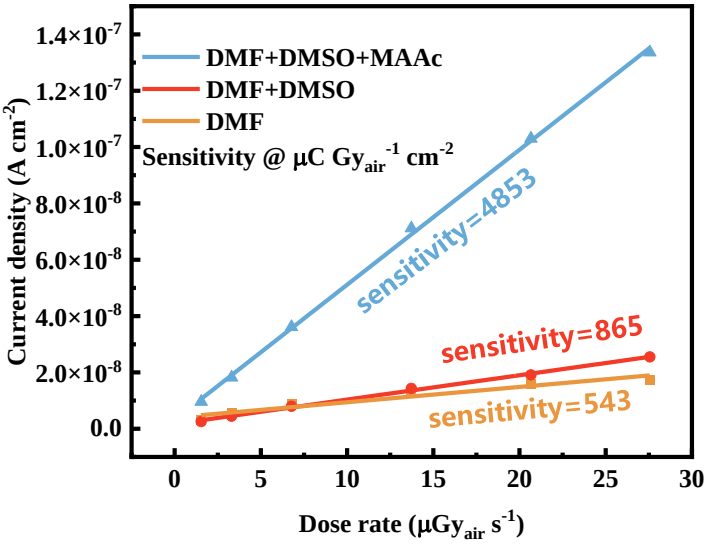


Figure S3. The sensitivity derived by linear fitting the dose rate dependent photocurrent of quasi-2D devices made by single, binary and ternary solvents .

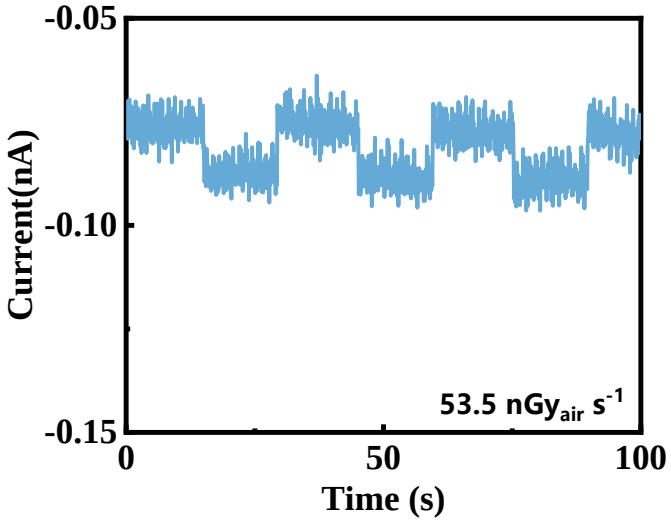


Figure S4. The photocurrent response of the target devices under on/ off X-ray illumination with the dose rate of 53.5 $nGy_{air}$ $s^{-1}$.

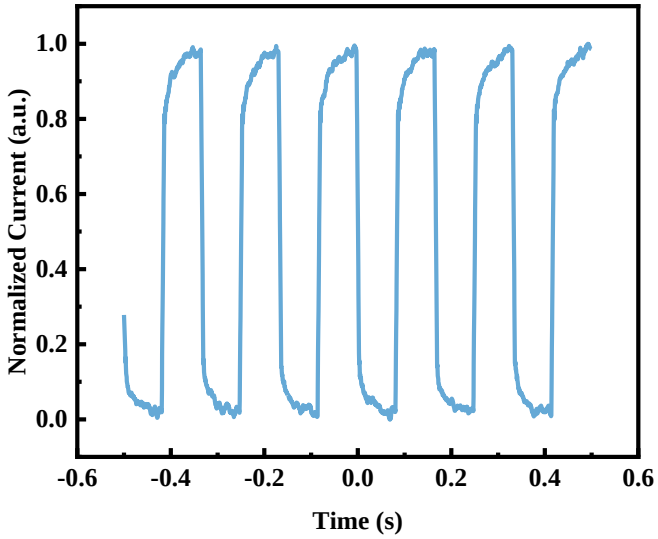


Figure S5. Temporal response of the 7 μm thick devices at 0 V bias under 532 nm LED illumination with a modulation frequency of 6 Hz.

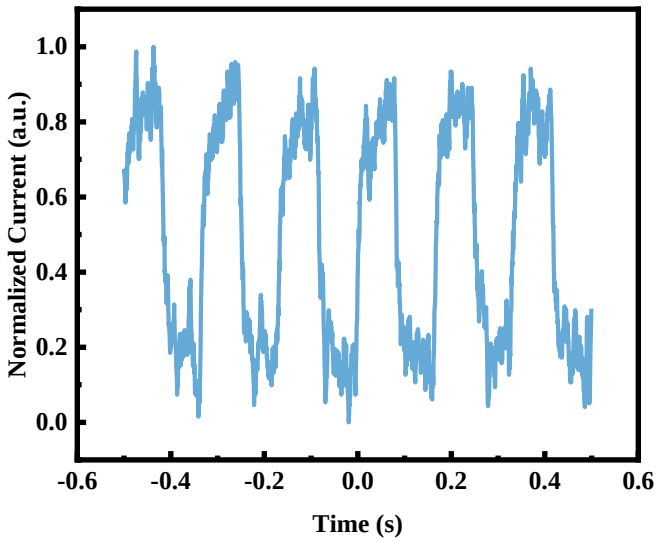


Figure S6. Temporal response of the 16 μm thick devices at 0 V bias under 532 nm LED illumination with a modulation frequency of 6 Hz.

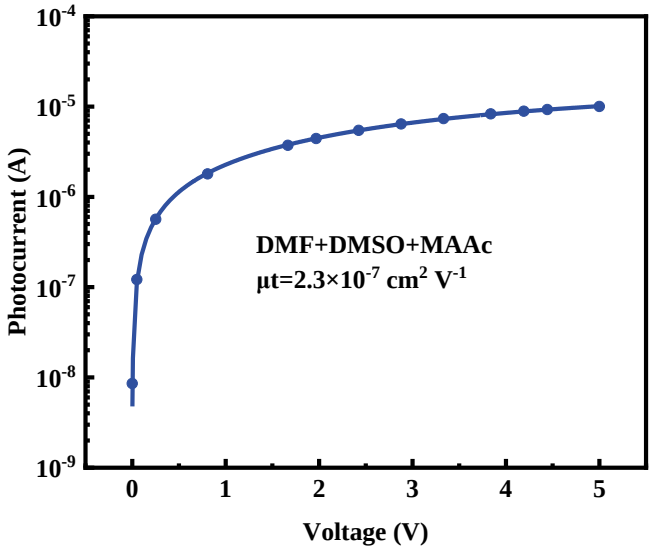


Figure S7. Voltage-dependent photocurrent curve of devices made by ternary solvents for the derivation of μτ product.

Table S1 Comparison of the device performance of different 2D perovskite X-ray detectors

| Materials | Detection Limit ($nGy_{air}$ $s^{-1}$) | Sensitivity ($\mu C$ $Gy_{air}^{-1}$ $cm^{-2}$) | Working bais (V) |
|---|---|---|---|
| $Cs_2Pb(SCN)_2Br_2$ film[1] | 42.4 | 216.3 | 40 |
| $(S\text{-}BPEA)_2FAPb_2I_7$ SC[2] | 161 | 87.8 | Self-driven |
| $(4AMPY)(MA)_3Pb_4I_{13}/MAPbBr_3$ SC[3] | 77 | 1850 | Self-driven |
| $PEA_2MA_4Pb_5I_{16}$ film[4] | 22.7 | 236 | 30 |
| $CsPb_2Br_5$ SC[5] | 12.7 | 8865.6 | 50 |
| $EPZPbBr_4$ SC[6] | <5.43 | 1240 | 10 |
| $(R/S\text{-}PPA)(IEA)PbBr_4$ SC[7] | 3 | 48.4 | Self-driven |
| This work 7 μm | 39 | 4853 | Self-driven |
| This work 16 μm | 27 | 8205 | Self-driven |

## Reference


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