Electronic Supplementary Material (ESI) for Materials Chemistry Frontiers.

Supplementary Information

Flexible, Rapid Response, Hybrid Inorganic-Organic $SnSe_2$-PEDOT:PSS Bulk Heterojunction based High-Performance Broadband Photodetector

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Composition of Drop cast solution: (5-20 mg - $SnSe_2$) + 1 ml DMF + 1 ml PEDOT:PSS

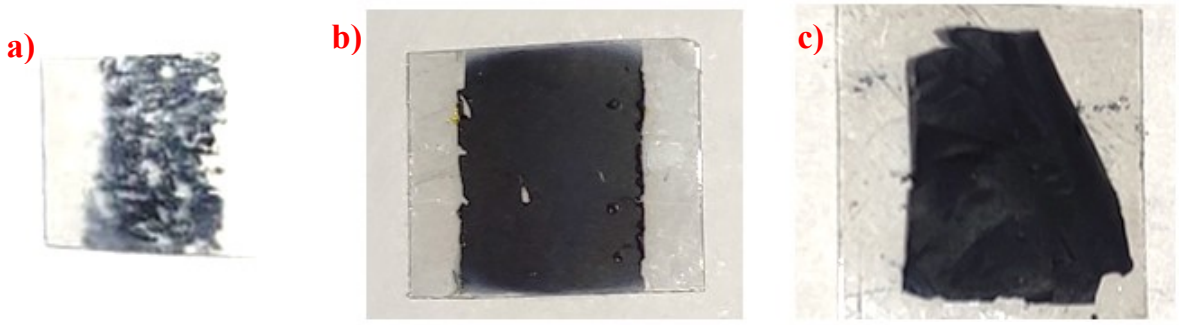

Figure S1. Films based on different concentrations of $SnSe_2$ in dispersion

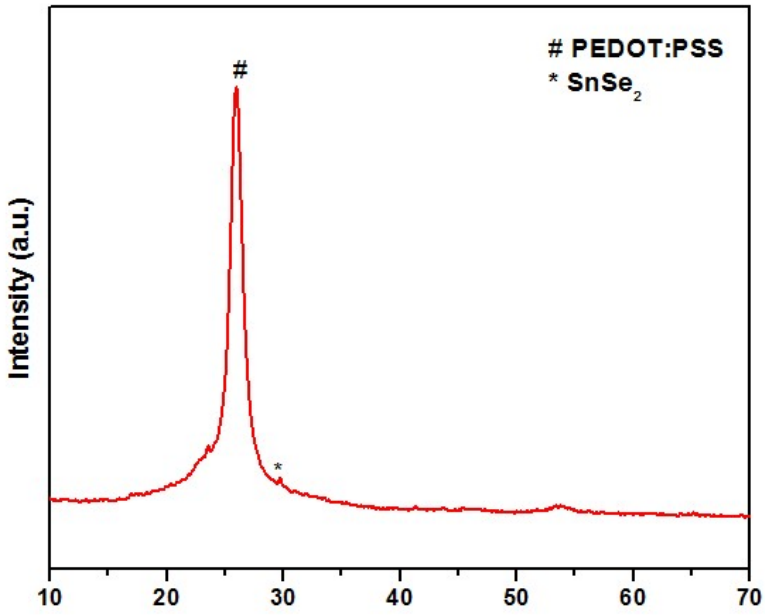

Figure S2. XRD spectra of PEDOT:PSS – $SnSe_2$ composite

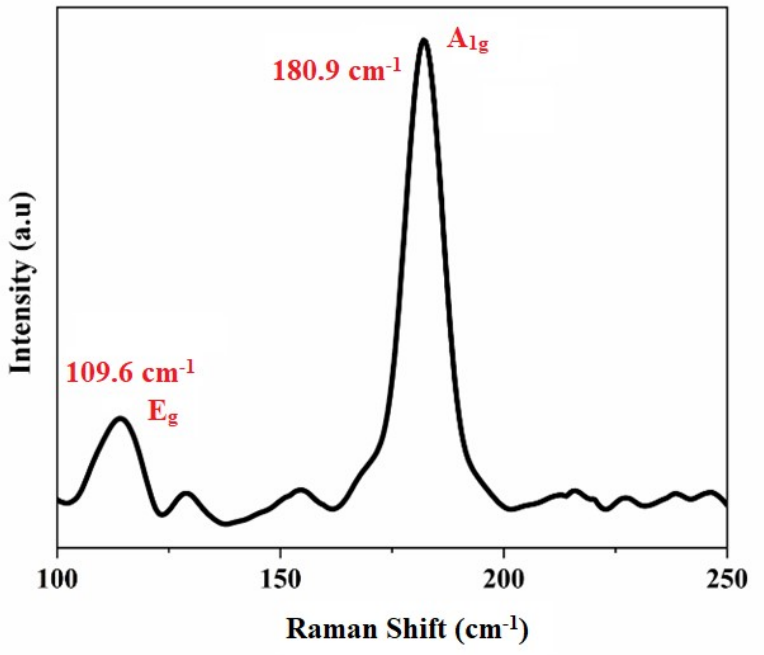

Figure S3. Raman spectra of $SnSe_2$ nanoflakes

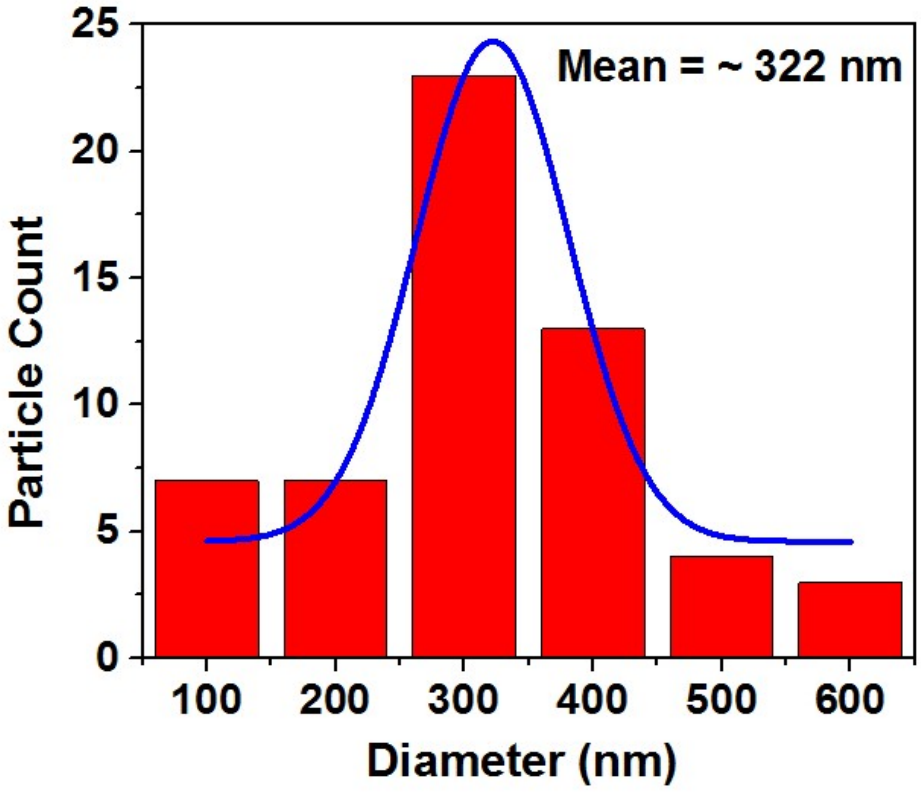

Figure S4: Gaussian distribution curve displaying the average diameter of $SnSe_2$ nanoflakes

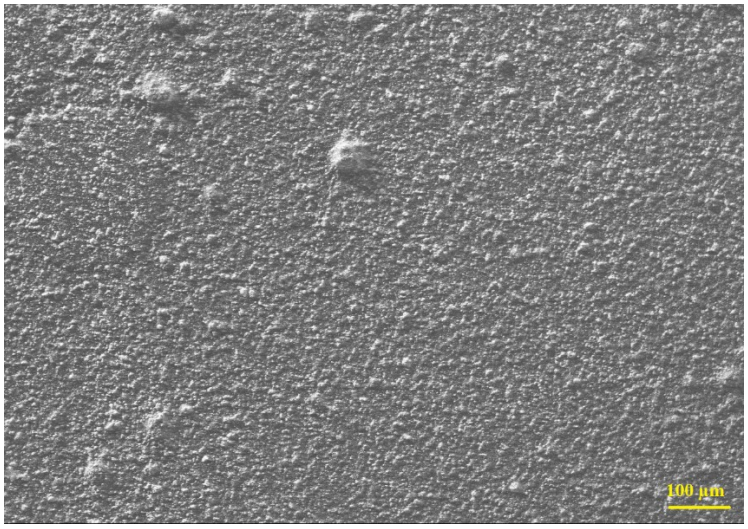

Figure S5. SEM image of drop-casted Bare PEDOT:PSS Film

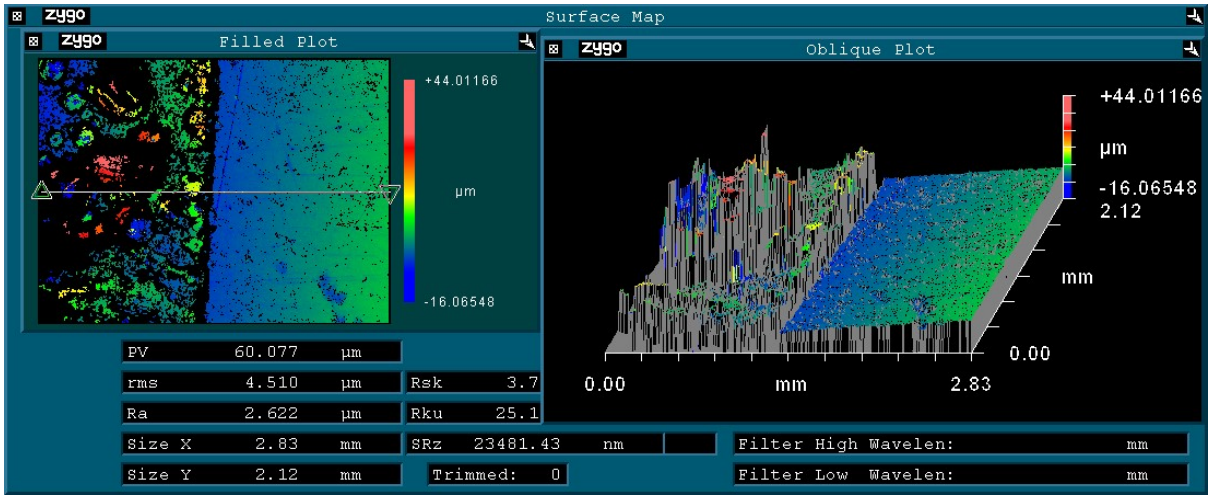

Figure S6. 3D optical profile of the $SnSe_2$-PEDOT:PSS film for thickness measurement.

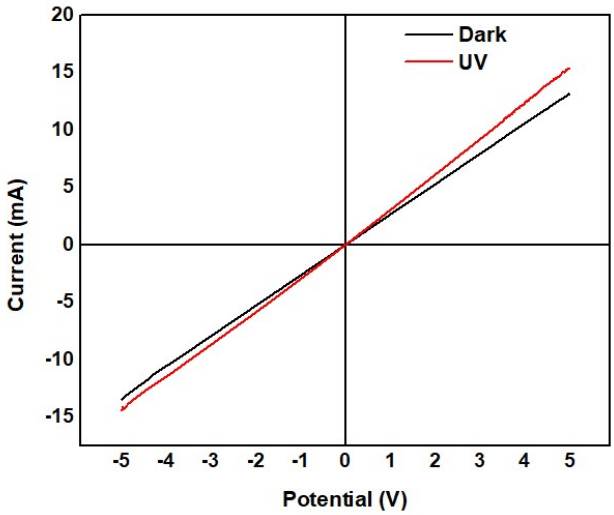

Figure S7. I-V characteristics of the bare ITO device under UV illumination

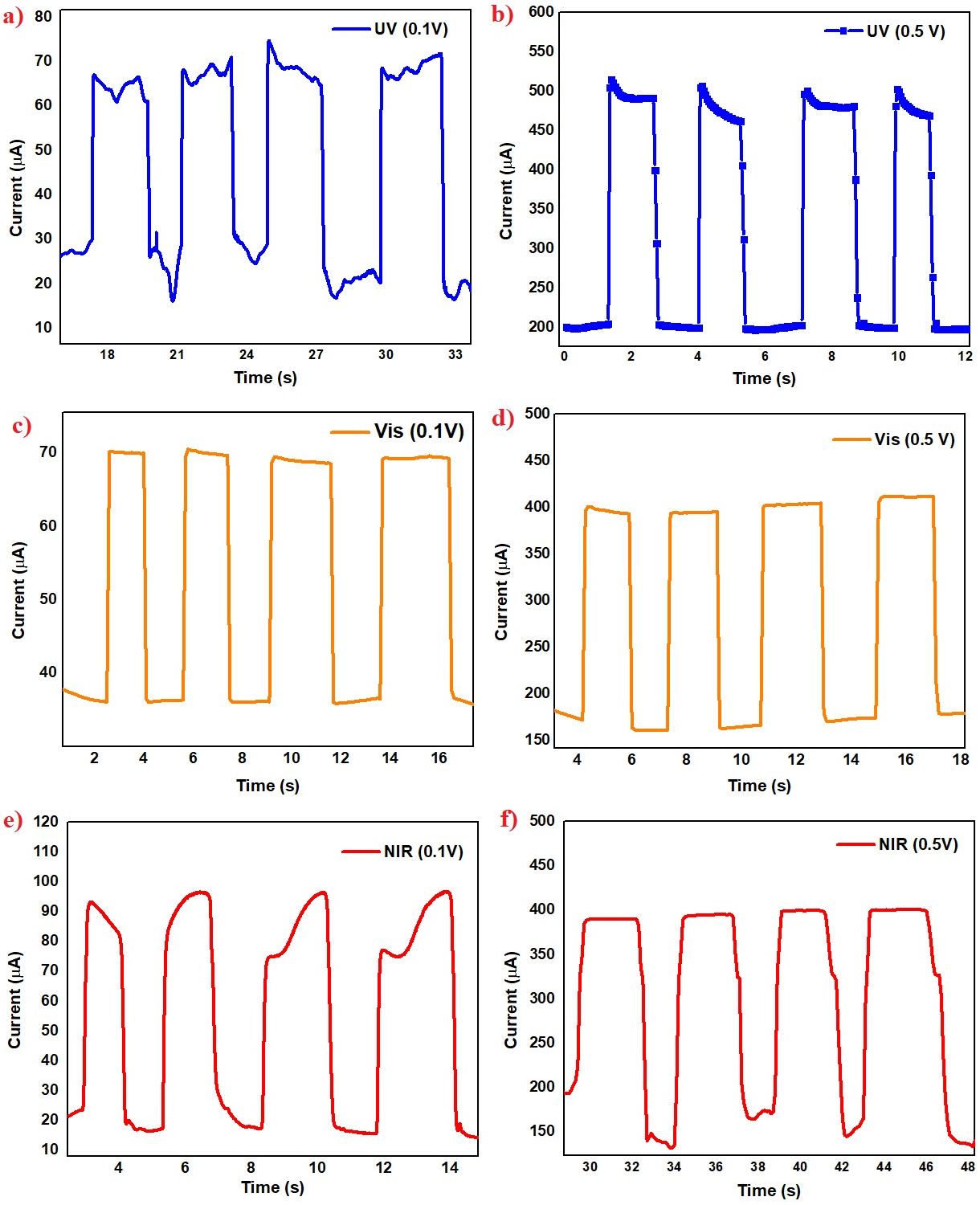

Figure S8. Temporal response device under UV, Vis and NIR spectra at bias voltages of 0.1 V and 0.5 V

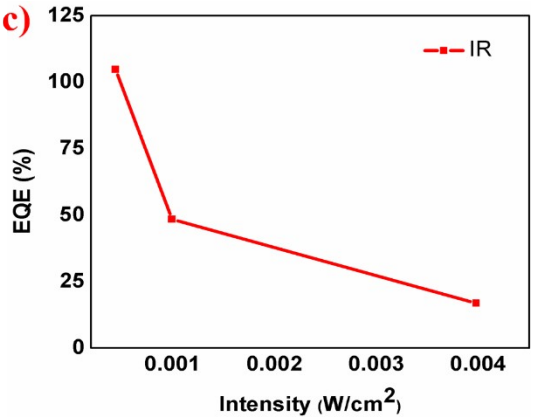

Figure S9. External Quantum Efficiency (EQE) under a) UV Light b) Visible Light and c) IR Light

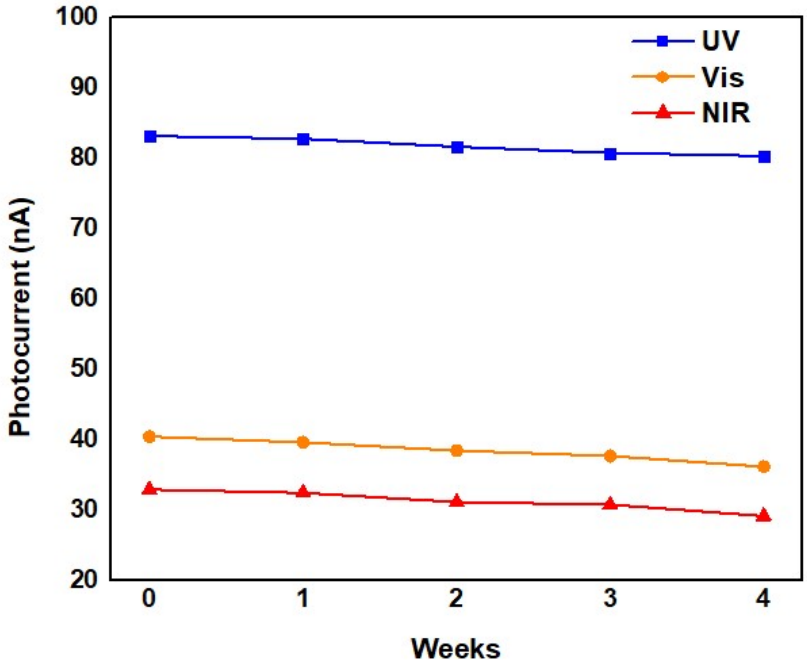

Figure S10. Photocurrent of the device towards UV, Vis and NIR spectra with respect to number of weeks exposed to ambient atmosphere.

Tauc's Plot for Bandgap Estimation

- For $SnSe_2$ – Direct Bandgap Semiconductor **: $(\alpha h\upsilon)^2 = h\upsilon$**
- For ITO - Indirect Bandgap Semiconductor : **$(\alpha h\upsilon)^{1/2} = h\upsilon$**

  υ = Frequency of incoming energy

  h = Planck's Constant

  α = Absorption Coefficient