Supporting Information

Diffusion-Induced Enhanced Photoresponsivity, Detectivity in Ag_2S and In_2Se_3 Heterostructure for UV-Visible Photodetector: An Experimental and Computational Analysis

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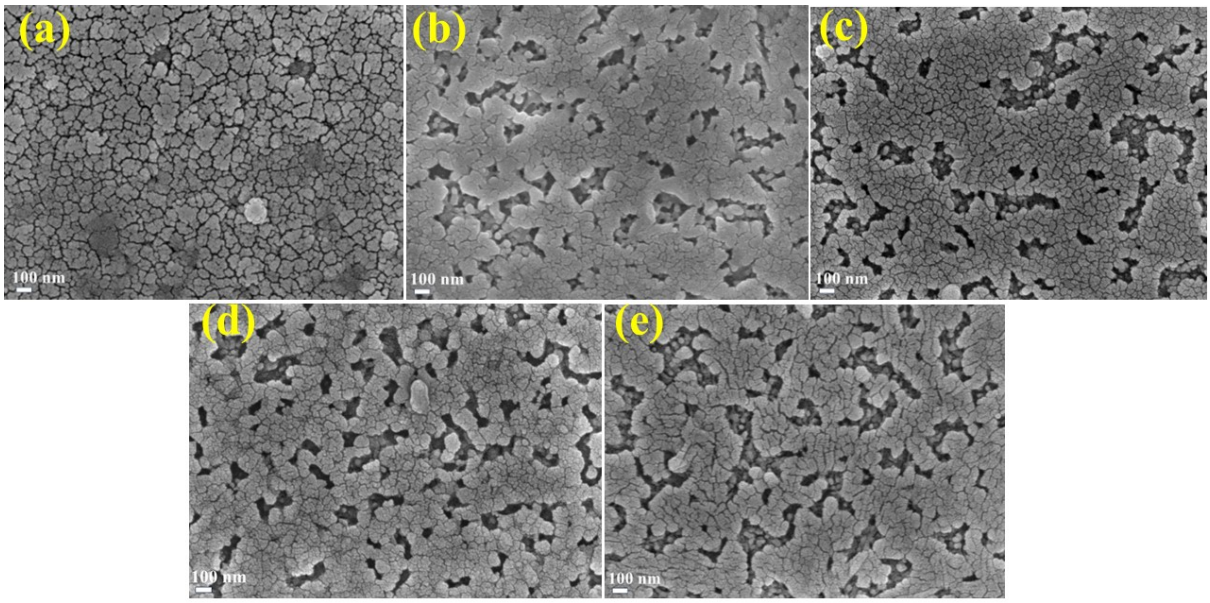

Fig. S1. FESEM images of (a)as-deposited, (b) 100 ºC, (c) 150 ºC, (d) 200 ºC, and (e) 250 ºC annealed films at 100 nm scale.

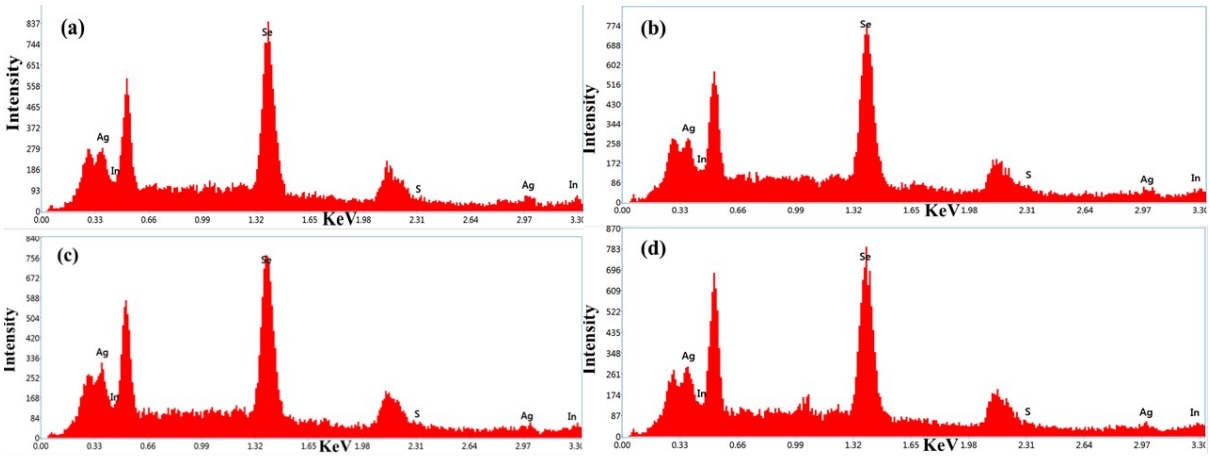

Fig. S2. EDS spectra of (a)as-deposited, (b) 100 ºC, (c) 150 ºC, (d) 200 ºC films.

Table S1. Elemental Ag, S, In and Se atomic percentages for different of the Ag_2S/In_2Se_3 films.

Sample	**Asp**	**100 °C**	**150 °C**	**200 °C**	**250 °C**
Element	**At. %**				
Ag	15.08	15.26	16.42	15.33	14.52
S	14.06	13.59	12.72	14.80	13.68
In	30.04	31.16	30.37	31.13	30.72
Se	40.82	40	40.49	38.74	41.08
Total	100.00	100.00	100.00	100.00	100.00

Table S2. Comparison data of photodetection parameters of other 2D/$InSe_2$ studies.

Photodetector materials	**Wavelength (nm)**	**Responsivity (R) (AW^{-1})**	**Detectivity (D*) (Jones)**	**Refs.**
In_2Se_3	450	137	10^{10}	1
InSe	700	10^{-2}	10^{10}	2
WS/InSe	520	0.061	10^{11}	3
WSe_2/In_2Se_3	980	2.21	10^{10}	4
β-In_2Se_3/Si	850	6.4	10^{10}	5
In_2Se_3	405	40	10^{11}	6
Ag_2S/In_2Se_3	400-700 (Vis)	5.03×10^{-2}	7.32×10^{9}	This work

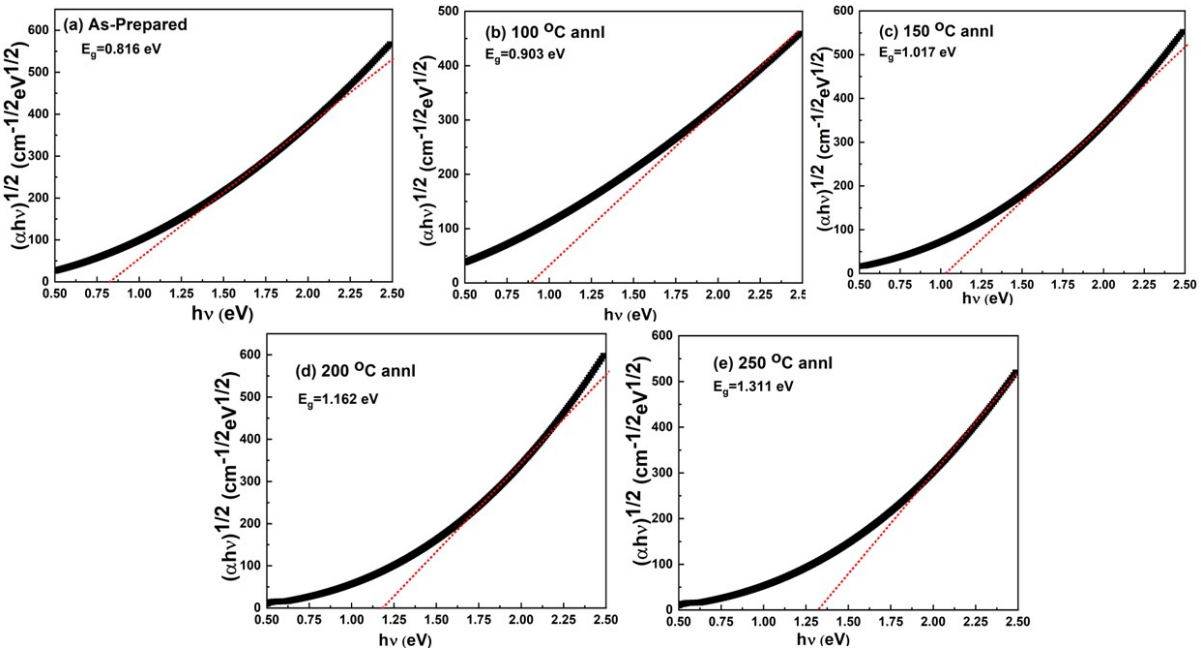

Fig. S3. Bandgap calculation of (a)as-deposited, (b) 100 °C, (c) 150 °C, (d) 200 °C, and (e) 250 °C annealed films.

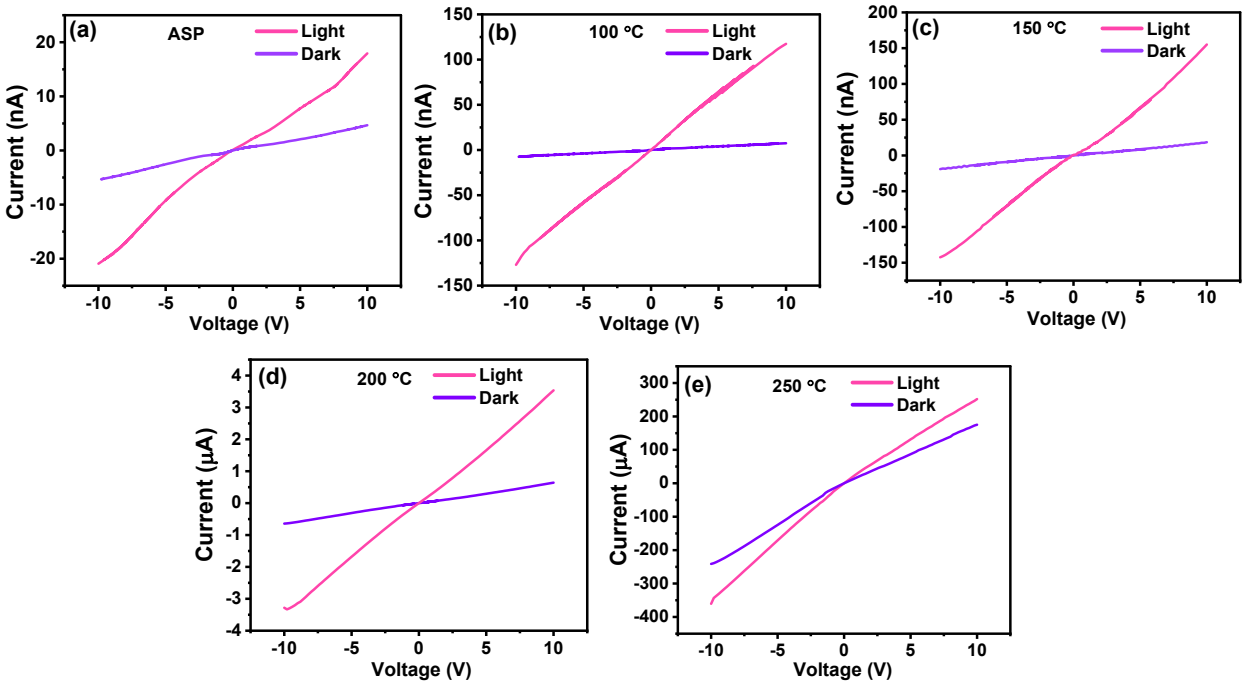

Fig. S4. I-V plots of both dark and light conditions for (a) as-deposited, (b) 100 °C, (c) 150 °C, (d) 200 °C, and (e) 250 °C annealed films.

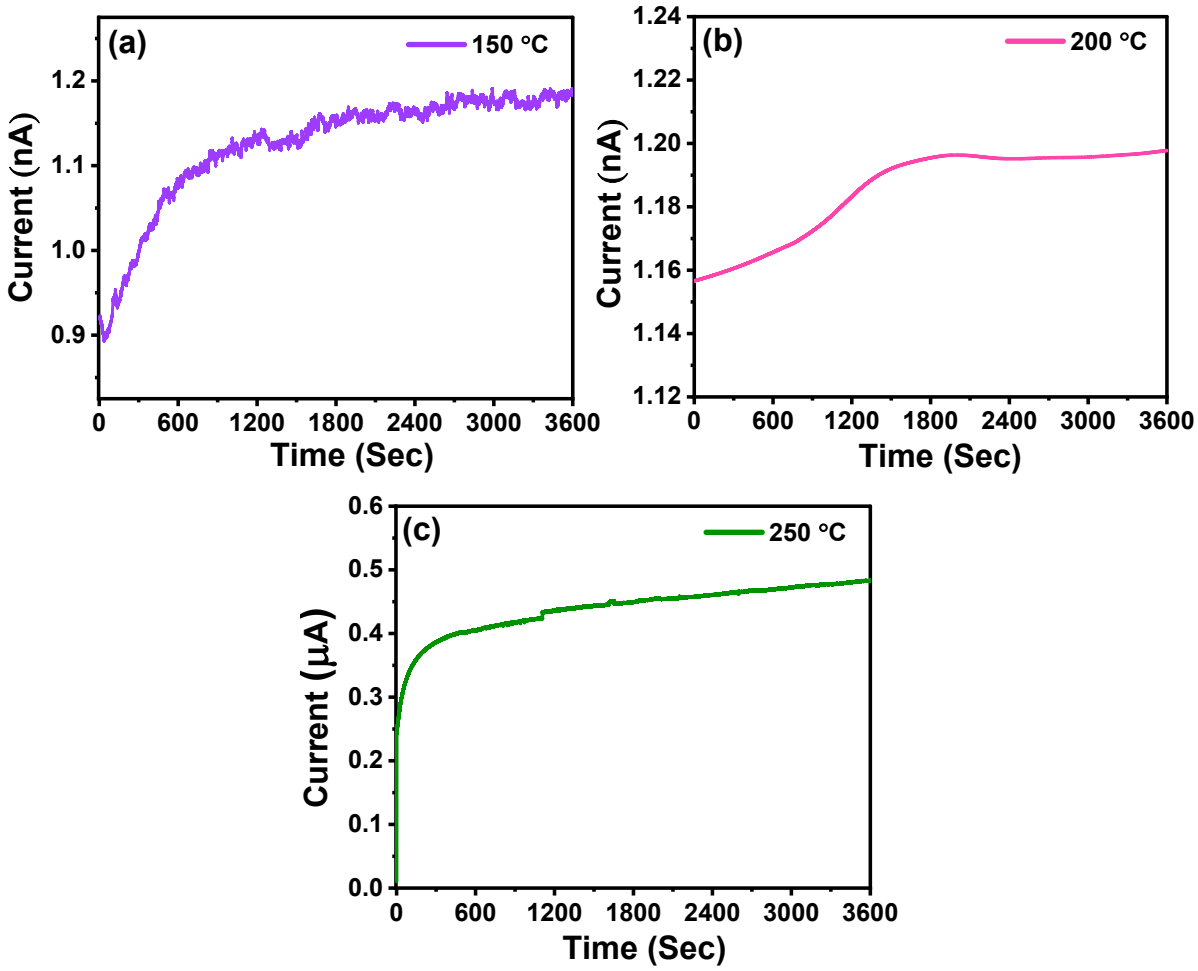

Fig. S5. I~T Stability plot of (a) 150 °C, (b) 200 °C, and (c)250 °C annealed Ag_2S/In_2Se_3 thin film.

Reference:

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