

Supporting Information

Enhanced Photodetectivity, Responsivity of Bi-S Films for Visible Light Photodetector: An Experimental and Density Functional Study

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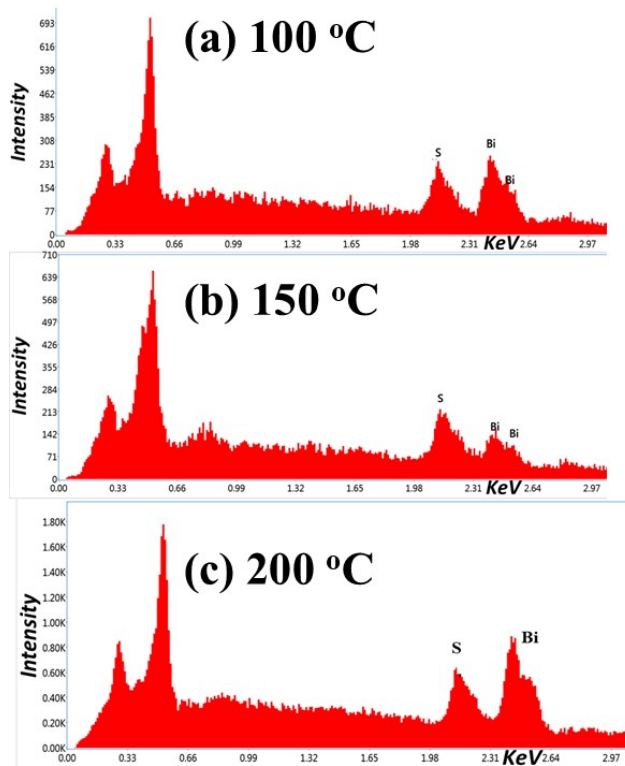


Fig. S1. EDX spectra for (a)100 °C (b)150 °C, (c)200 °C annealed thin films.

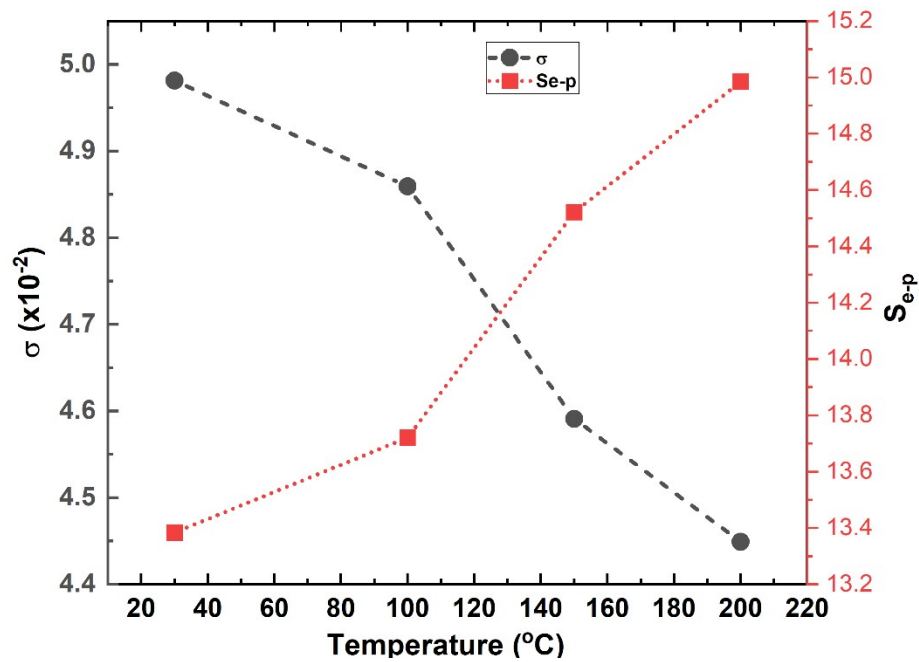


Fig. S2. Variation of the steepness parameter and the electron-phonon strength with annealing temperature.

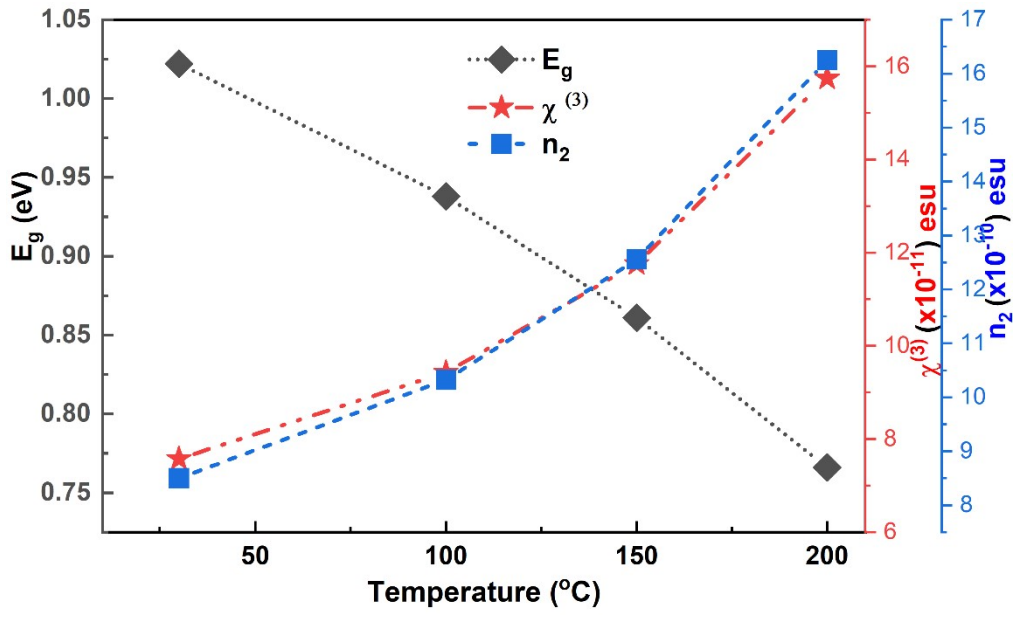


Fig. S3. Variation of E_g , $\chi^{(3)}$ and n_2 at different annealing temperatures.

Table S1. Comparison of χ^3 values with other for Bi_2S_3 or similar chalcogenides.

Sample name	χ^3 (esu)	Reference
Bi_2S_3	$2.699 - 2.701 \times 10^{-10}$	1
$\text{Bi}_2\text{S}_{2.75}\text{Se}_{0.25}$	$4.797 - 6.512 \times 10^{-10}$	1
Bi_2S_3	6.25×10^{-11}	2
Bi_2S_3 nanocrystals doped in sodium borosilicate glass	1.43×10^{-10}	3
Bi_2S_3	$7.574 - 15.744 \times 10^{-11}$	This Work

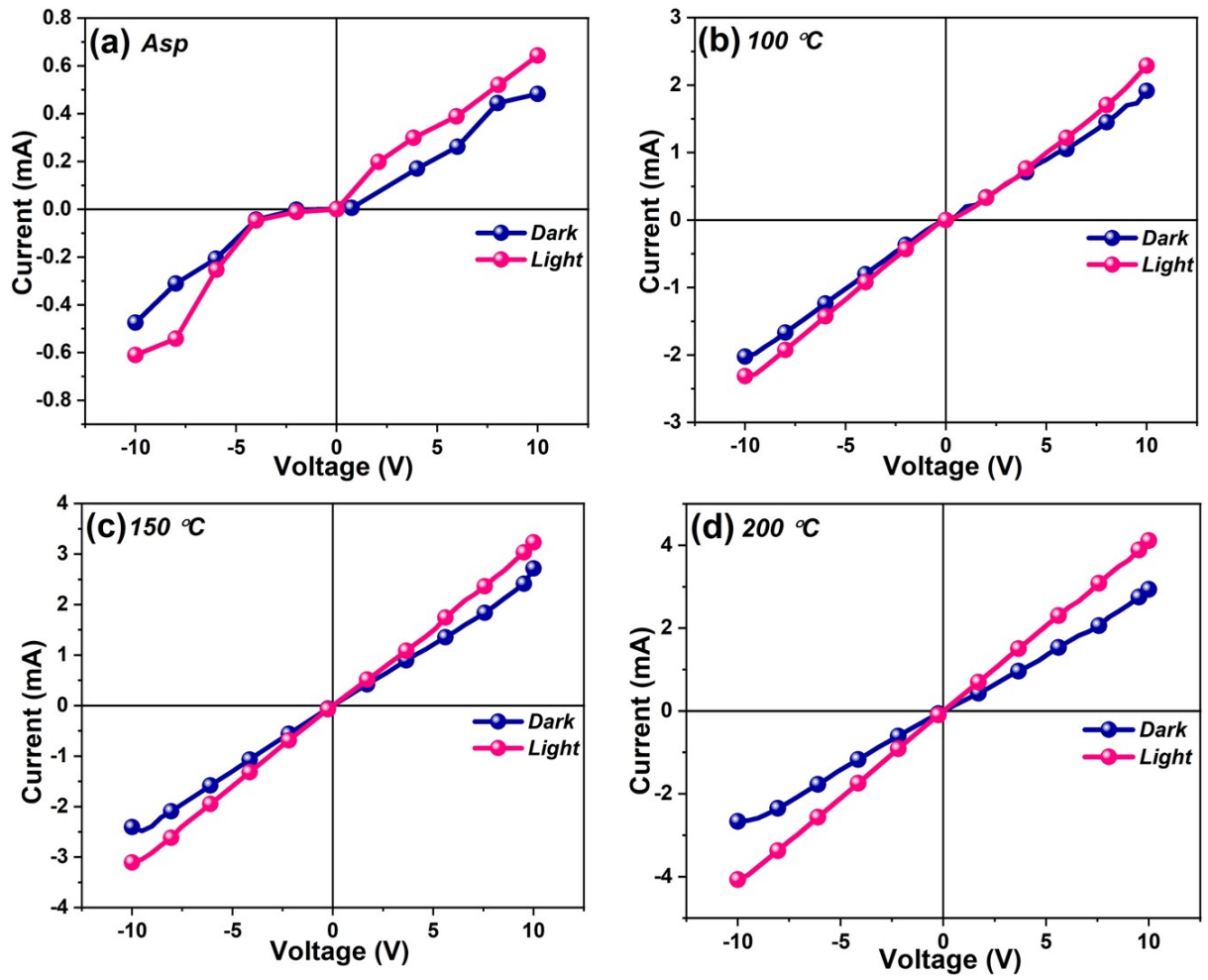


Fig. S4. I-V characteristics plot of individual samples (a) Asp, (b) 100 °C, (c) 150 °C, and (d) 200 °C of Bi_2S_3 thin films.

Reference:

1. Ben Abdallah, H., Ouerghui, W. Spin-orbit coupling effect on electronic, linear and nonlinear optical properties of Bi_2S_3 and the ternary bismuth sulfide $\text{Bi}_2\text{S}_{2.75}\text{Se}_{0.25}$: Ab-initio calculations. *Opt. Quant Electron*, 2022, **54**, 20.
2. C. Li, G. Shi, Y. Song, X. Zhang, S. Guang, H. Xu, Third-order nonlinear optical properties of Bi_2S_3 and Sb_2S_3 nanorods studied by the Z-scan technique. *J. Phys. Chem. Solids*, 2008, **69**, 1829-1834.
3. X. Yang, W. Xiang, H. Zhao, X. Zhang, X. Liang, S. Dai, F. Chen, Third-order nonlinear optical properties of Bi_2S_3 nanocrystals doped in sodium borosilicate glass studied with Z-scan technique. *Mater. Res. Bull.*, 2011, **46**, 355-360.