

Supporting Information

ZnSb/Ti₃C₂T_x MXene van der Waals heterojunction for flexible near-infrared photodetector arrays

Chuqiao Hu¹, Ruiqing Chai¹, Zhongming Wei¹, La Li^{2, †} and Guozhen Shen^{2, †}

¹State Key Laboratory for Superlattices and Microstructures, Institute of Semiconductors, Chinese Academy of Sciences, Beijing 100083, China.

Center of Materials Science and Optoelectronic Engineering, University of Chinese Academy of Sciences, Beijing 100049, China.

²School of Integrated Circuits and Electronics, Beijing Institute of Technology, Beijing 100081, China.

*Corresponding author:

E-mail address: lali@bit.edu.cn (L. Li); gzshen@bit.edu.cn (G. Shen)

Keywords: ZnSb nanoplates, Ti₃C₂T_x MXene, Van der Waals heterojunction, Flexible photodetector, Image sensing.

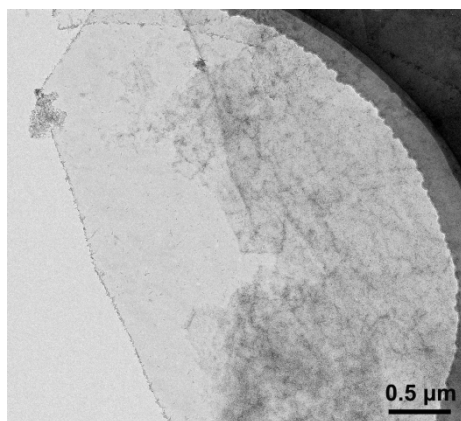


Fig. S1. TEM image of the $\text{Ti}_3\text{C}_2\text{T}_x$ MXene nanoplates.

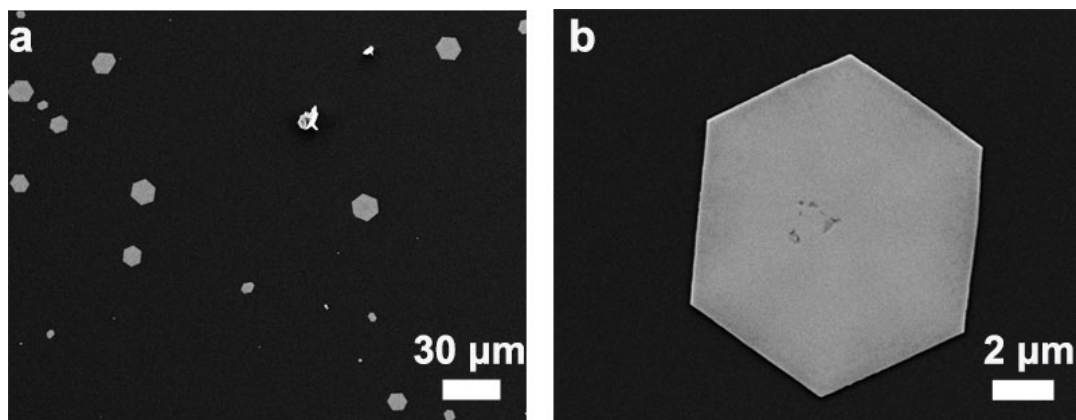


Fig. S2. (a,b) SEM images of the ZnSb nanoplates with increased magnification.

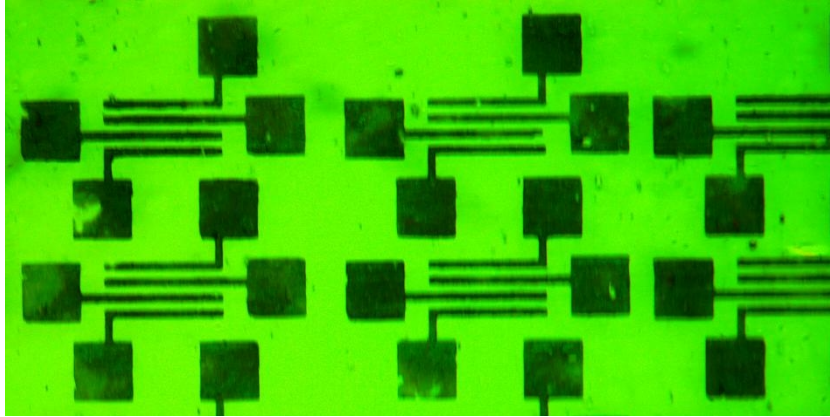


Fig. S3. The optical microscope image of the patterned $\text{Ti}_3\text{C}_2\text{T}_x$ electrodes array. The channel lengths of the devices are all $10\text{ }\mu\text{m}$.

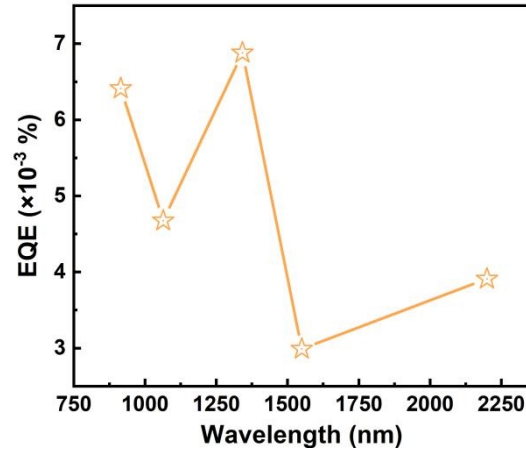


Fig. S4. The EQE of the ZnSb/Ti₃C₂T_x PD at five different laser irradiation. Among them, the EQE under the irradiation of 1550 nm laser is the lowest, which is $2.99 \times 10^{-3}\%$, and the highest is $6.88 \times 10^{-3}\%$ under the irradiation of 1342 nm laser, the EQE under the irradiation of 915, 1064 and 2200 nm laser is 6.41, 4.68 and $3.91 \times 10^{-3}\%$ respectively.

Table S1. Performance parameters of ZnSb/Ti3C2Tx MXene PDs at different wavelengths.

Wavelength/ (nm)	On-off ratio	Responsivity/ ($\mu\text{A/W}$)	Detectivity/ Jones
915	3.90	47.3	8.7×10^7
1064	8.77	40.1	7.4×10^7
1342	12.76	74.4	12.4×10^7
1550	6.78	37.4	7.6×10^7
2200	8.22	69.4	14.2×10^7

Table S2. Photocurrent, dark current and On-off ratios of ZnSb/Ti₃C₂T_x MXene PDs at 1342 nm with different optical power densities.

1342 nm			
Light intensity/ (mW/cm ²)	I _{on} / (pA)	I _{off} / (pA)	On-off ratio
178.00	9.7	0.76	12.76
132.00	6.1	0.77	7.96
74.80	4.5	0.75	6.03
36.00	3.4	0.69	4.96
15.90	2.3	0.76	3.03

Table S3. Performance parameters of ZnSb/Ti₃C₂T_x MXene PDs at 1342 nm with different optical power densities.

1342 nm			
Light intensity/ (mW/cm ²)	Responsivity/ (μA/W)	Detectivity/ Jones	External quantum efficiency (EQE × 10 ⁻³ %)
178.00	74.41	1.24 × 10 ⁸	6.88
132.00	59.37	0.99 × 10 ⁸	5.49
74.80	75.66	1.26 × 10 ⁸	6.99
36.00	123.87	2.06 × 10 ⁸	11.45
15.90	143.49	2.39 × 10 ⁸	13.26