A Silicon-Based Two-Dimensional Chalcogenide of p-type Semiconducting Silicon Telluride Nanosheets for Ultrahigh Sensitive Photodetector Applications

Chang-Yu Lin[†,*,a], Rajesh Kumar Ulaganathan[†,*,b,c], Raman Sankar*[,d], Raghavan Chinnambedu Murugesan[e], Ambika Subramanian[a], Alex Rozhin[e] and Shaik Firdoz[f]

[a]Department of Mechanical Engineering, Chung Yuan Christian University, Taoyuan-32023, Taiwan.

e-mail: cylin@cycu.edu.tw

[b]Center for Condensed Matter Sciences, National Taiwan University, Taipei-10617, Taiwan

[c]Department of Photonics Engineering, Technical University of Denmark, Roskilde-4000, Denmark.

e-mail: urajeshiitr@gmail.com

[d]Institute of Physics, Academia Sinica, Taipei-11529, Taiwan.

e-mail: sankarraman@gate.sinica.edu.tw

[e]Aston Institute of Photonic Technologies, Aston University, Birmingham- B4 7ET, UK

[f]Schulich Faculty of Chemistry, Technion-Israel Institute of Technology, Haifa-32000, Israel
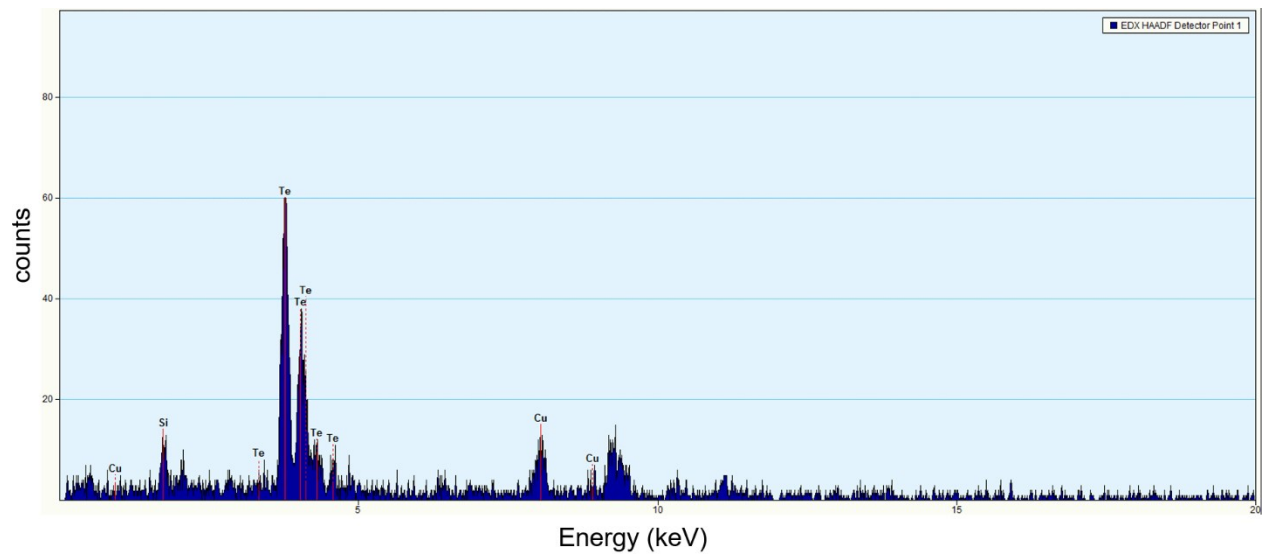
† Authors contributed equally

Figure S1. EDS spectrum of the bulk Si_2Te_3 single crystal.

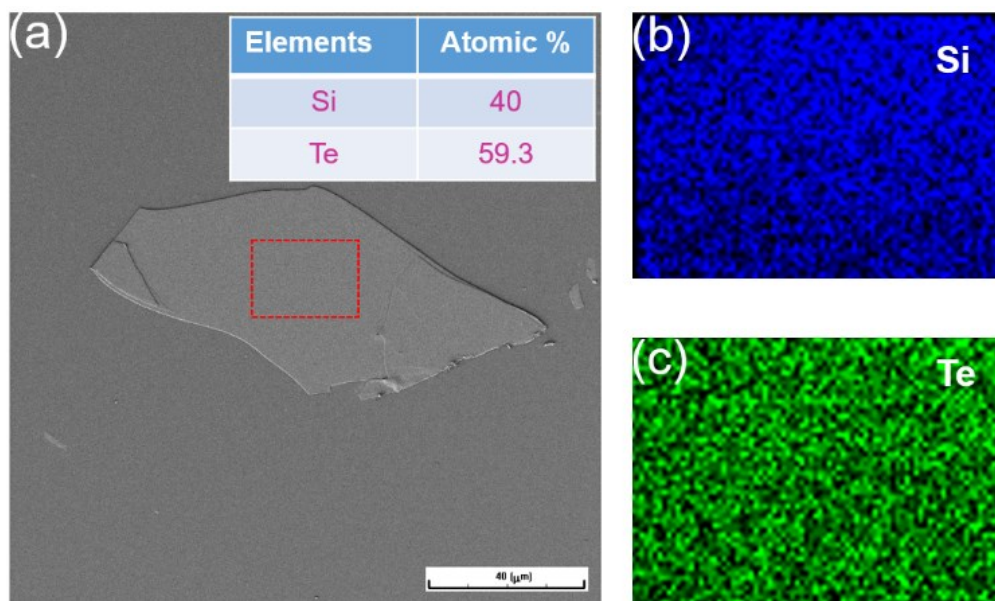| Elements	Atomic %
Si	40
Te	59.3

Figure S2. Elemental mapping of the as-synthesized exfoliated Si_2Te_3 nanosheets that reveals the presence of Si and Te and confirming the atomic weight percentage of Si and Te are ~ 40:59.3.
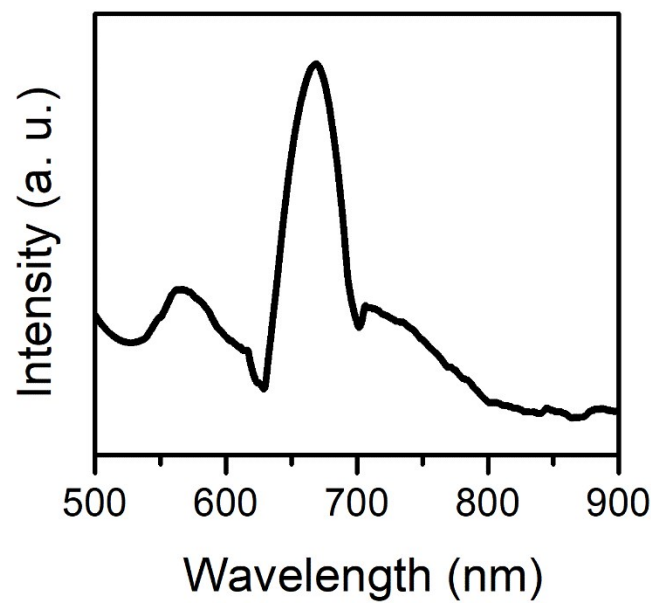
Figure S3. Photoluminescence spectrum of Si_2Te_3 from 500-900 nm wavelength region.
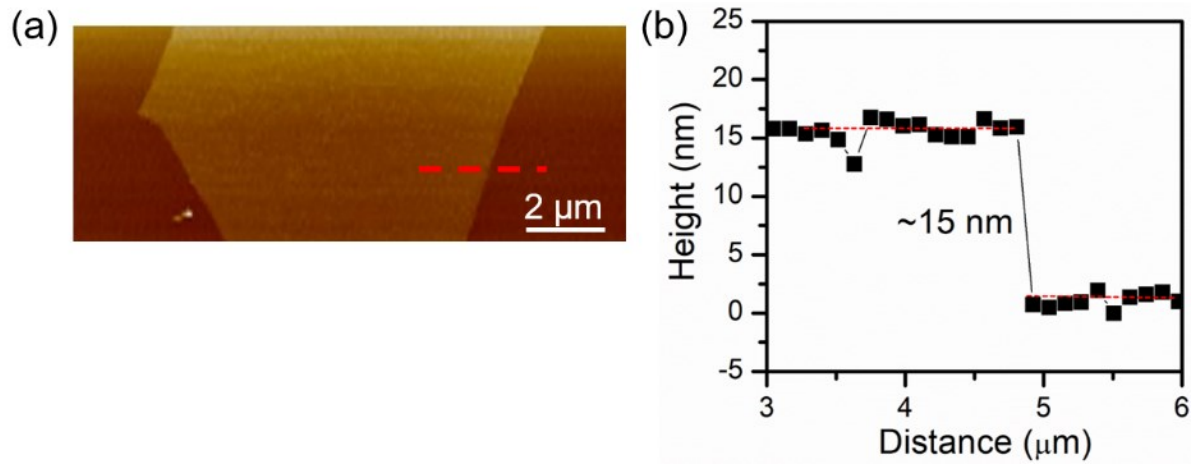
Figure S4. (a) Atomic force microscopic image of Si_2Te_3 nanosheets and (b) the thickness profile with Si_2Te_3 nanosheets thickness ~15 nm.
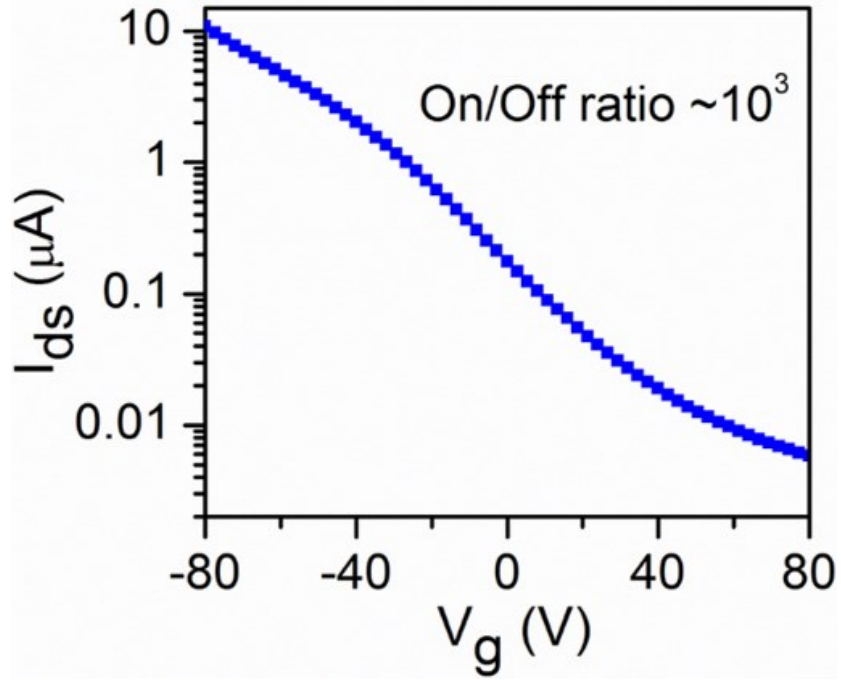
Figure S5. The measured I_{ds}-V_g curve of a few-layered Si_2Te_3-FET indicates the on/off current ratio of~10^3.
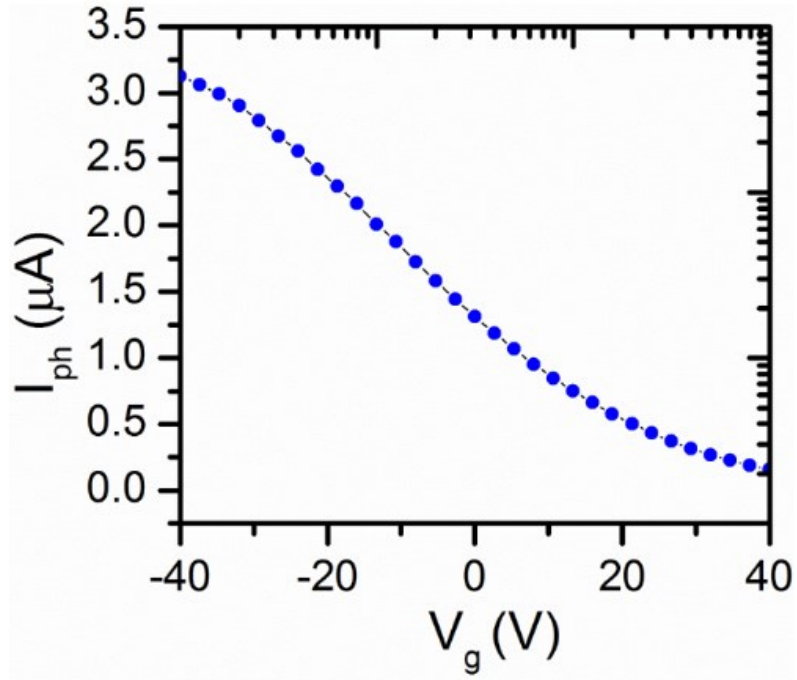
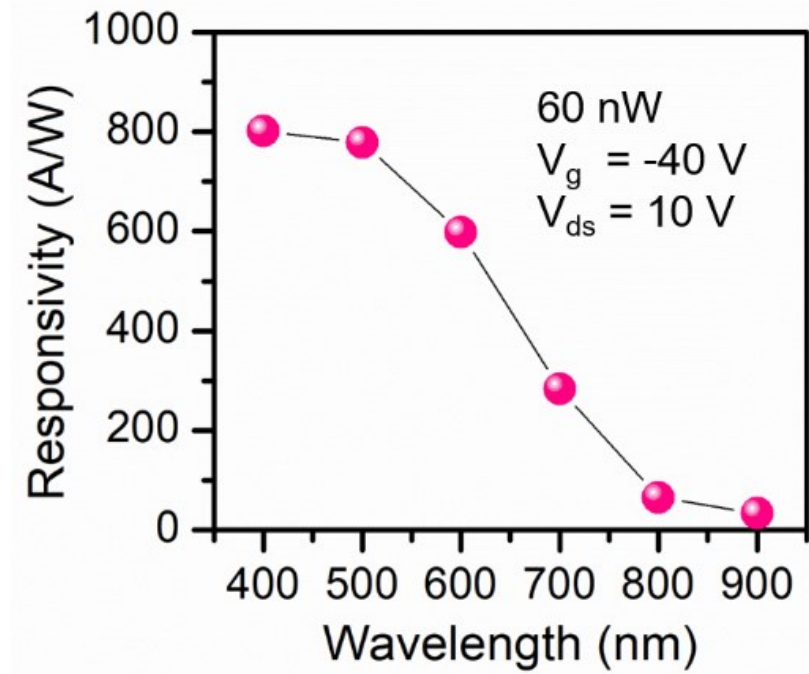**Figure S6.** I_{ph} vs V_g curve with sweep +40 to -40 V at $V_{ds} = 10V$

Figure S7. The measured responsivity of the Si_2Te_3-FET device for different excitation wavelengths.

Table S1. Comparison of performances of other 2D photodetectors

Materials	Measurement Conditions	R_λ (A/W)	D* (Jones)	Normalized Gain $(cm^2 V^{-1})$	References
Si_2Te_3	405 nm 6 V	65	2.81×10^{12}	-	1
Bi_2Te_3	650 nm 0.5 V	23.43	1.54×10^{10}	-	2
Sb_2Te_3	980 nm 1 V	21.7	1.22×10^{11}	-	3
WSe_2	650 nm 1 V	7.55	3.0×10^{12}	-	4
MoS_2	532 nm 1.2 V	59	-	-	5
ReS_2	633 nm 50 mV	16.14	-	-	6
2H-MoS2 /1T@2H-MoS2	530 nm 20 V	1227	4.84×10^{11}	-	7
Black Arsenic Phosphorus	2400 nm 0V	0.18	4.9×10^9	-	8
InSe	685 nm 0 V	0.244	10^{11} to 10^{12}	-	9
MoS_2	561 nm	880	-	48×10^{-7}	10
MoS_2-UCNP	532 nm	81	6.8×10^{13}	8.4×10^{-5}	11
Si_2Te_3	633 nm 10 V	1396	$\sim 2.52 \times 10^{12}$	$\sim 2.74 \times 10^{-4}$	This Work

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