Supporting Information

High Sensitive and Fast Phototransistor Based on Large Size CVD-grown SnS_2 Nanosheets

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Table S1. The performance of phototransistors based on 2D materials[1-7]

Material	on/off ratio (FET)	Responsivity (mA/W)	Response time (ms)	Reference
Monolayer WSe_2	~10^9	171	23	1
Multilayer b-P	10^3	4.8	1	2
Multilayer MoS_2	~10^6	110	~10^3	3
Multilayer WS_2	--	0.092	5.3	4
Monolayer MoS_2	~10^5	2.2×10^6	--	5
Multilayer GaSe	--	2.8×10^3	20	6
Multilayer GaS	--	4.2×10^3	30	7
Multilayer SnS_2	--	8.8	0.005	8
Multilayer SnS_2	$>10^6$	1×10^5	22	This work

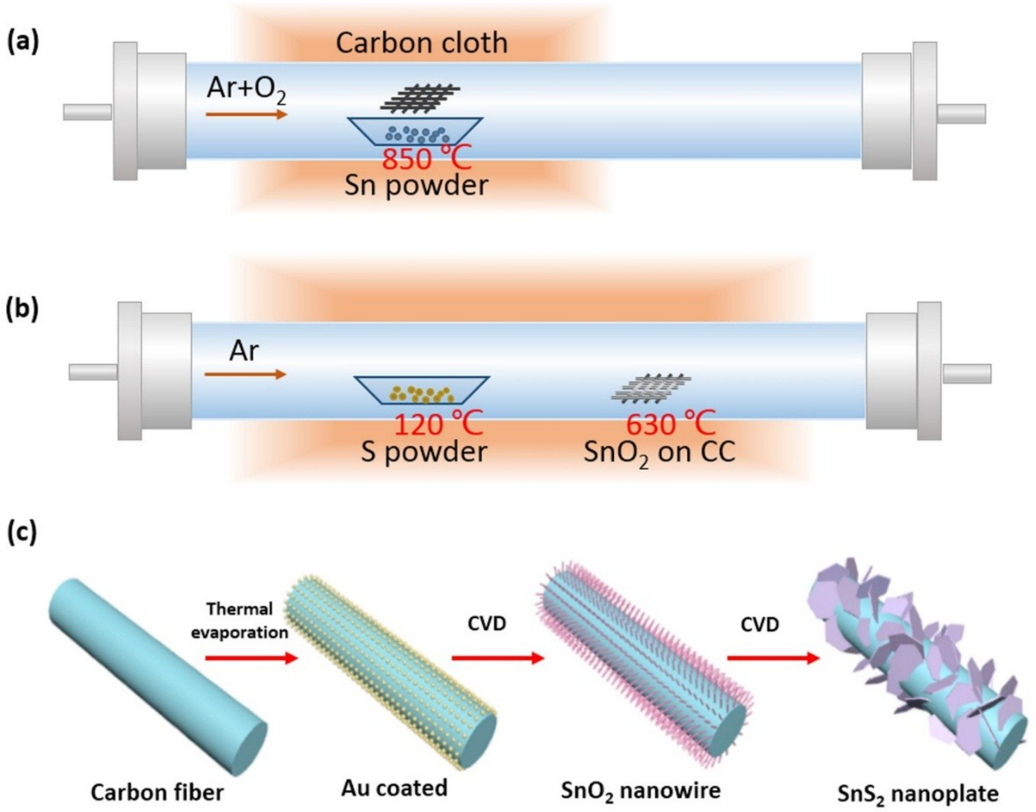

Fig. S1 Schematic diagram of experimental setting for (a) SnO_2 growth (b) SnS_2 growth. (c) The growth process of SnS_2 nanosheets on carbon cloth.

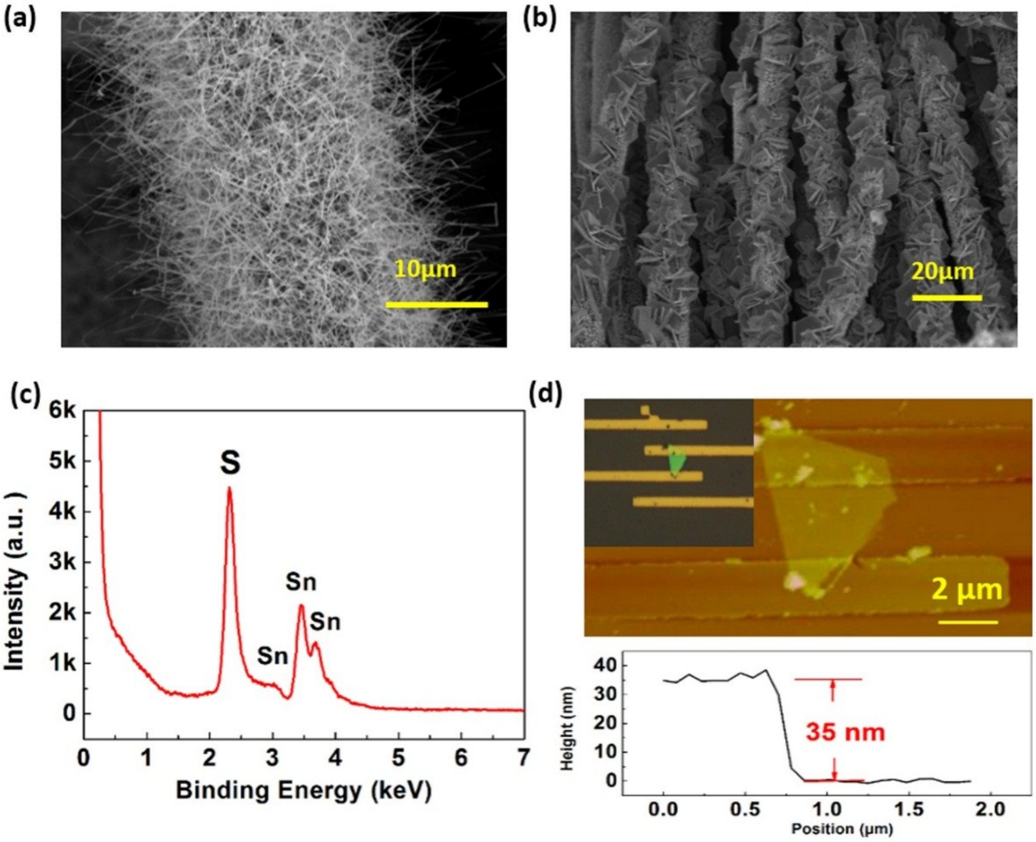

Fig. S2 The SEM image of as-grown (a) SnO_2 nanowire (b) SnS_2 nanosheets on carbon cloth. (c) EDX pattern of the SnS_2 nanosheets. (d) AFM image of the device, inset is the optical microscope image.

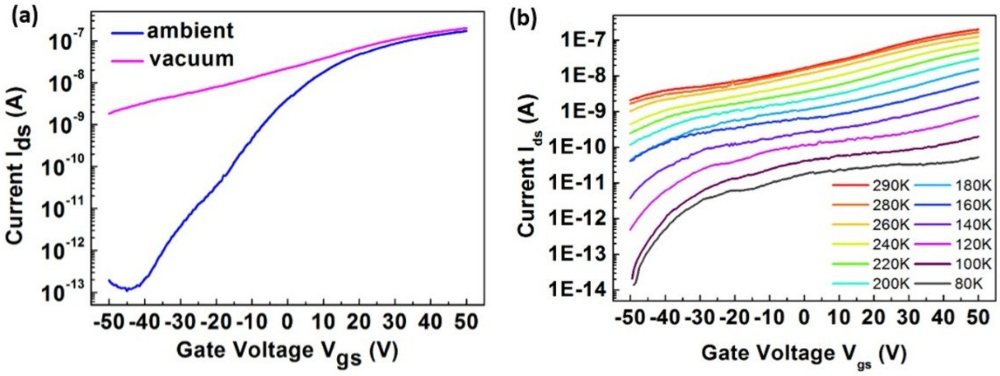

Fig. S3 (a) Transfer curves at room temperature in vacuum versus in ambient. (b) Transfer curves in varied temperatures from 80 K to 290 K.

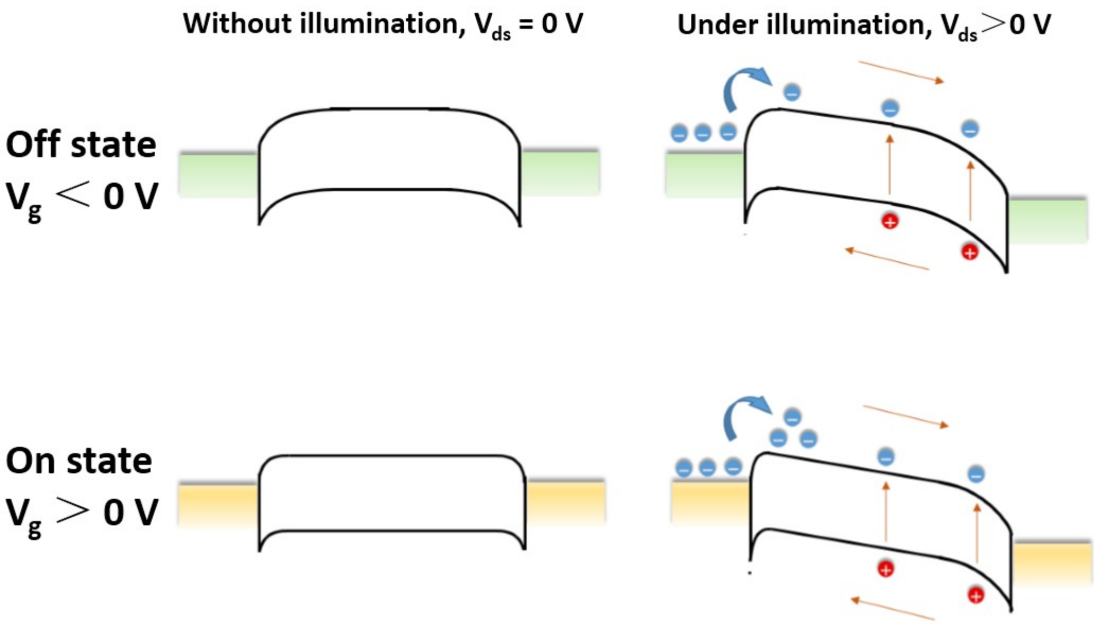

Fig. S4 Energy band diagram of the photodetector in different conditions.

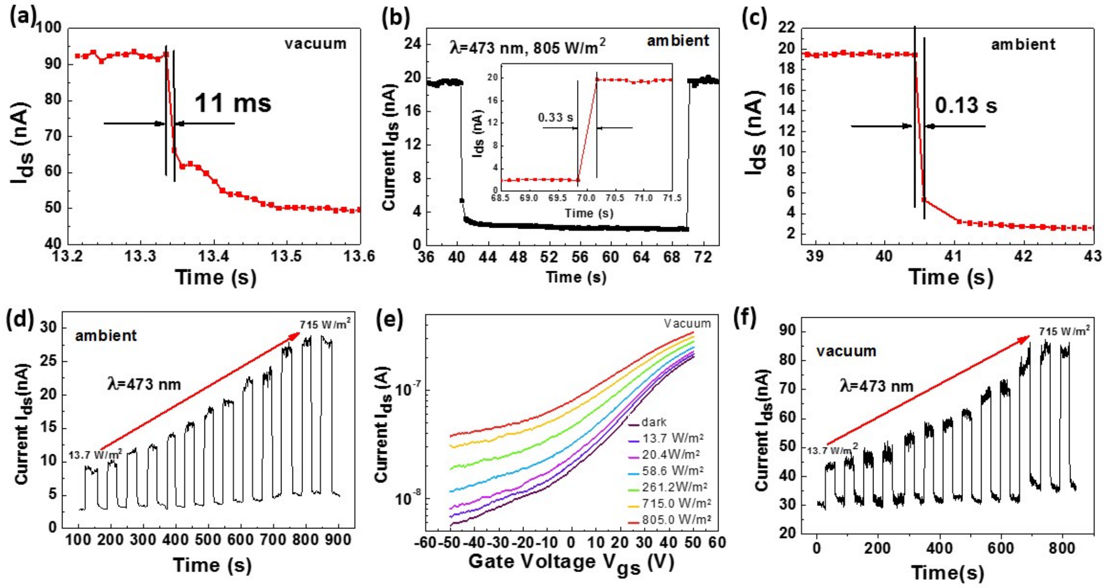

Fig. S5 Complementary light response curves. (a) Decay time of the device in vacuum. (b) One time-resolved photoresponse cycle in ambient, inset: the rising time of the same device (V_{ds} = 3 V, ambient, the laser power density is 805 W/m^2). (c) Decay time of the device in ambient. (d) Continuous *I*-*t* curve with increasing light intensity in ambient (V_{ds} = 3 V, V_{gs} = 0 V). (e) I_{ds}-V_{gs} (V_{ds} = 3 V) curves of this device under different light intensity in vacuum. (f) Continuous *I*-*t* curve with increasing light intensity in vacuum (V_{ds} = 3 V, V_{gs} = 0 V).

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