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Supporting information

Large-area synthesis of monolayer WS_2 and its ambient-sensitive photo-detecting performance

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Supporting Figure S1

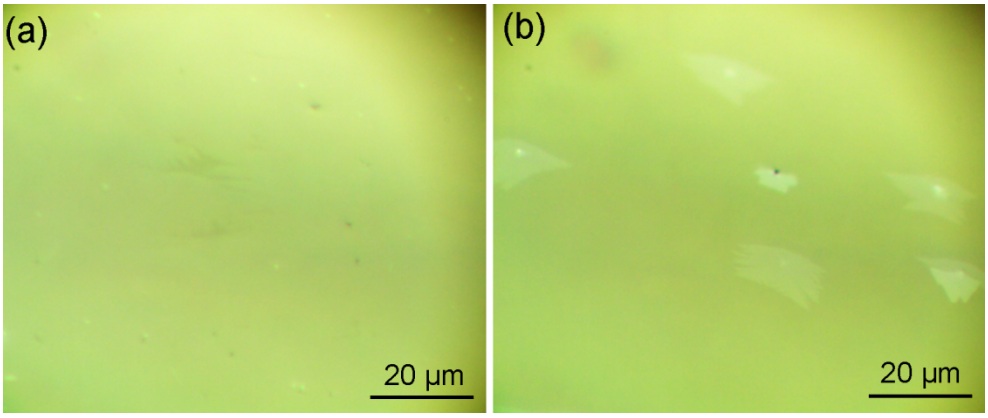

Figure S1. Optical microscopy images of as-grown monolayer WS_2 film and flakes on sapphire substrates with (a) and without seeding (b).

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Supporting Figure S2

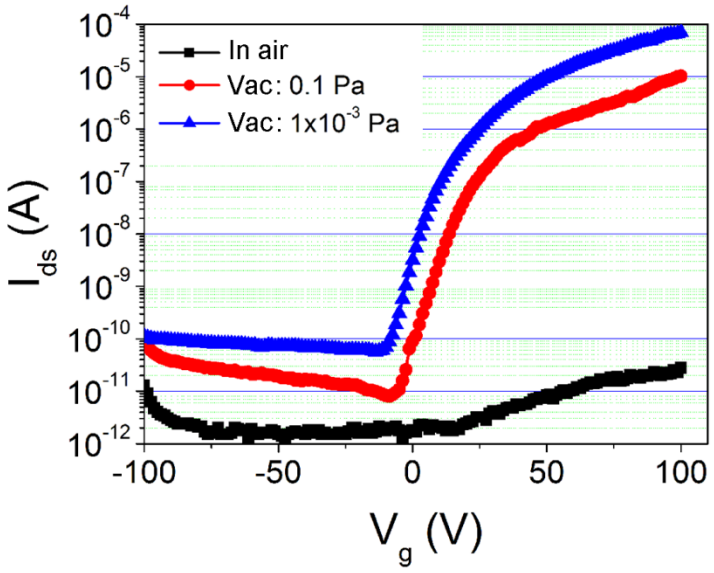

Figure S2. Transport characteristics (I_{ds}-V_g) in air and in vacuum. The drain-source voltate (V_{ds}) is 20 V.

Supporting Table S1.

Table S1. FET performance in different pressures.

Measure Environment	Mobility ($cm^2/V \cdot s$)	ON/OFF ratio	Sub-threshold Swing (V/decade)
In air	1.87×10^{-7}	10	50
Vacuum of 0.1Pa	0.21	10^6	6.6
Vacuum of 1×10^{-3}Pa	0.91	10^6	4.9

Supporting Table S2

Table S2. Summary of the literature reports on the electrical transport and photoresponse performance of atomically thin WS_2 crystals.

Sample	Contact electrode	L/W (μm)	Mobility ($cm^2/V·s$)	On/Off ratio	R	Response time	Ref.
WS_2 nanoflakes (exfoliated)	Ti/Au	20/15	12	10	5.7 A/W (633 nm)	<20ms	1
Single layer WS_2 (exfoliated)	Ti/Au	6.8/2.5	~1-2 (10 hours High temperature annealing in 10^{-4} Pa vacuum)	10^6	N/A	N/A	2
Multilayer layer WS_2 (exfoliated)	Au	5/2	234	10^8	N/A	N/A	3
Single layer WS_2	Ni/Au	6.5/4	9.5	N/A	N/A	N/A	4
Single layer WS_2 (CVD-grown)	Ti/Au	1/(N/A)	0.01 (in air)	10^5	N/A	N/A	5
Few layer films (CVD-grown)	Ti/Au	50/500	N/A	N/A	21.2 μA/W (647 nm)	~5.3ms (in air)	6
Multilayer WS_2 (CVD-grown)	Ti/Au	2.5/2.0	N/A	10^5	N/A	N/A	7
Monolayer WS_2 (CVD-grown)	Al	30/230	0.91 (1×10^{-3} Pa)	10^6	18.8 mA/W (532 nm, 1×10^{-3} Pa)	<4.5ms (in air)	This work

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