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Electronic Supplementary Information:

Large Scale ZrS_2 Atomically Thin Layers

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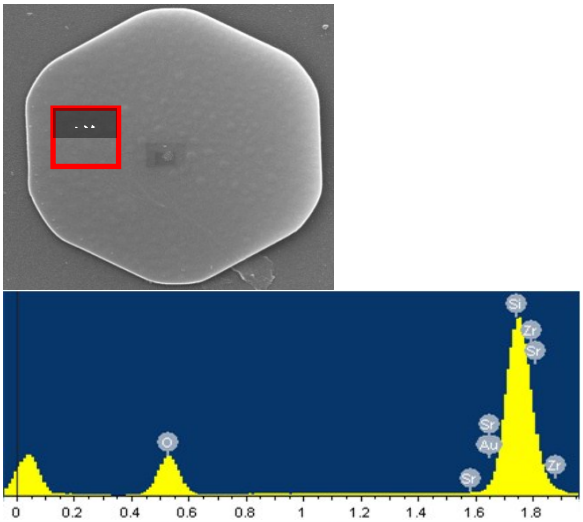
S1: energy dispersive X-ray spectroscopy of the ZrS_2 nanoflake：



Element	Wr(%)	Ar(%)
O K	35.12	55.44
Si K	35.76	32.15
S K	8.94	7.04
Sr L	2.92	0.84
Zr L	15.50	4.29
Au M	1.76	0.23

Figure S1. Energy dispersive X-ray spectroscopy of the ZrS_2 nanoflake. From the table about the weight and atoms percentages, we can figure out the existence of S and Zr elements with an atom ratio of 1:1.7. Sr, Au are the impurity element along with the tweezer and Si, O are the element on the substrate.

S2: Reactor-conditions-dependent ZrS_2 growth with varying temperature and flow rate of nitrogen:

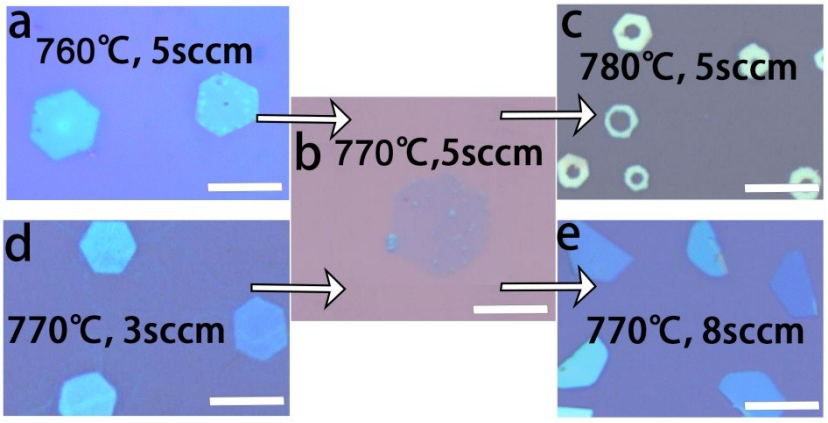


Figure S2. Optical microscope images of ZrS_2 samples grown at different temperature under designed flow rate for 6 min: (a) 760 °C; (b) 770 °C; (c) 830 °C; (d)770 °C, 3 sccm; (e) 770 °C, 5 sccm; (f) 770 °C, 8 sccm.

S3: XPS data for the as-synthesized ZrS_2 nanoflakes:

The XPS has also been measured and found that the atomic composition was $ZrS_{1:1.9}$, in approximate agreement with the ratio of ZrS_2 (Table S1). But due to the relatively low-density ZrS_2 nanoflakes on silica, the XPS peak is a bit rough and unapparent, especially the sulfur peaks (Fig. S3a-c). The atomic concentration n can be expressed as n=I/S (I is the area of the element peak, S is the Atomic sensitivity factor). Based on the data from the Table R1, S_S and S_{Zr} is 1.881 and 9.032, respectively. Thus in spite of higher n_S than n_{Zr}, lower S_S result in the unapparent sulfur element peak.

Table S1. Summary of the ZrS_2 nanoflakes XPS peak.

Name	FWHM eV	Area (P) CPS.eV	Area (N) TPP-2M	Atomic %	SF ALTHERMO1
Si2p	1.57	5818.1	0.14	16.35	0.9
S2p	0.2	1021.98	0.01	1.39	1.881
Zr3d	1.25	2572.22	0.01	0.73	9.032
C1s	1.64	13328.56	0.3	34.99	1
O1s	1.69	47768.3	0.4	46.54	2.881

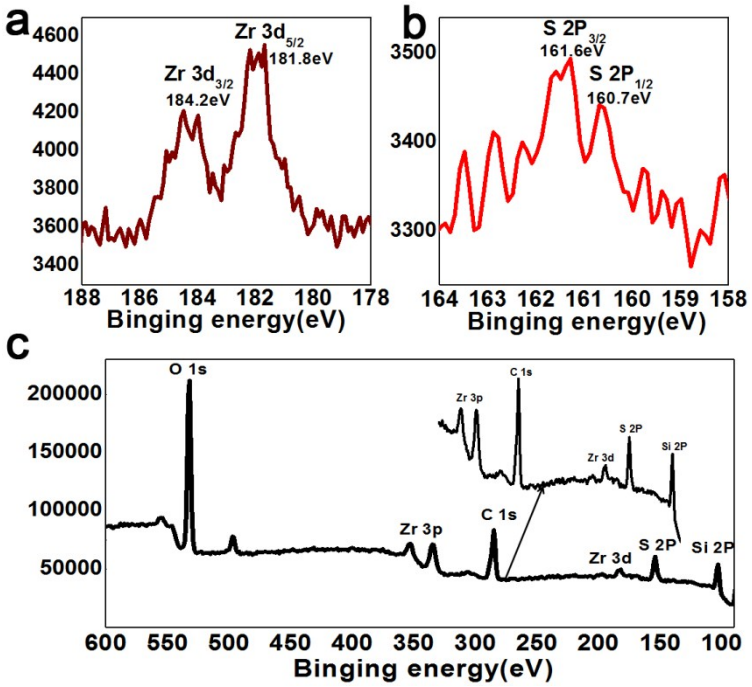


Figure S3. XPS spectra of as-synthesized ZrS_2.