Electronic Supplementary Material (ESI) for Nanoscale.

Core@Shell and Lateral Heterostructures Composing of SnS and NbS_2

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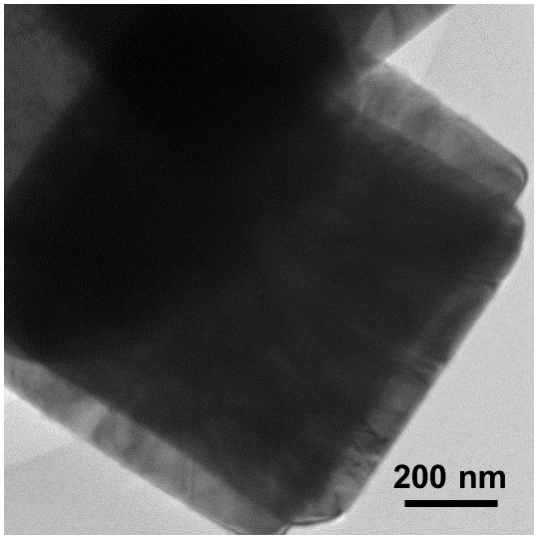

Figure S1 TEM image of SnS microplates.

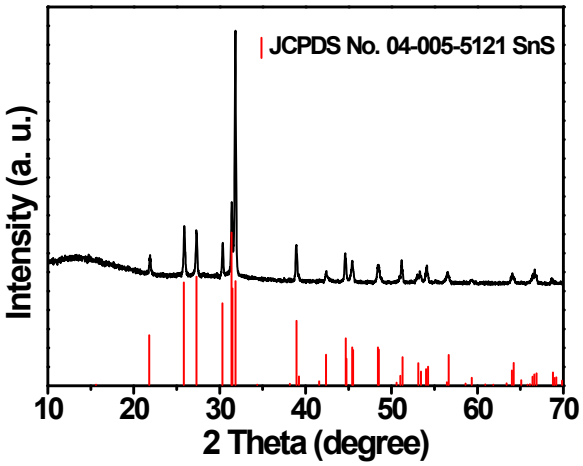

Figure S2 XRD pattern of SnS microplates.

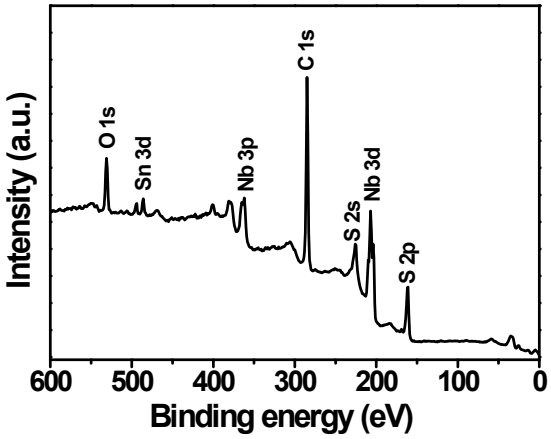

Figure S3 XPS full scan spectrum of the SnS@NbS_2 core@shell heterostructures.

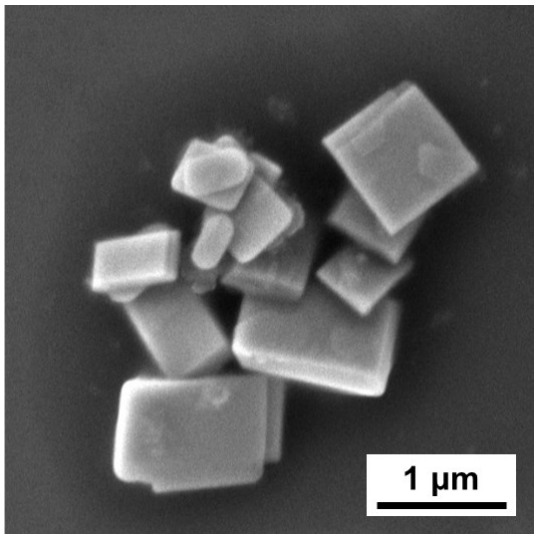

Figure S4 SEM image of the product obtained at 280 °C with the ratio of Nb : Sn being 3 : 7.

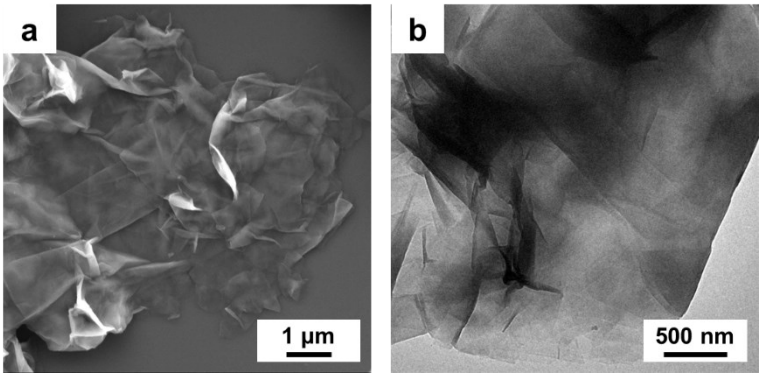

Figure S5 (a) SEM image and (b) TEM image of NbS_2 nanosheets obtained at 300 °C.

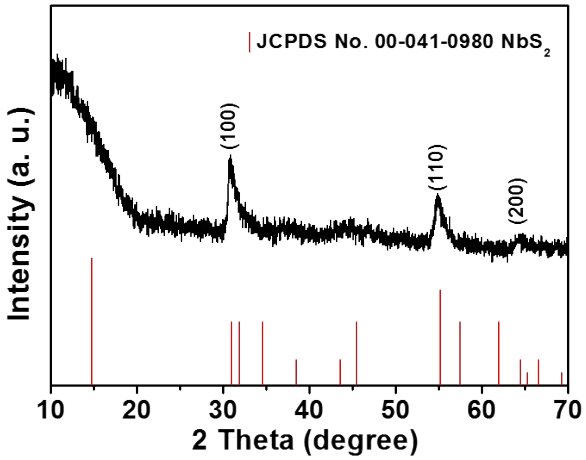

Figure S6 XRD pattern of NbS_2 nanosheets obtained at 300 °C.

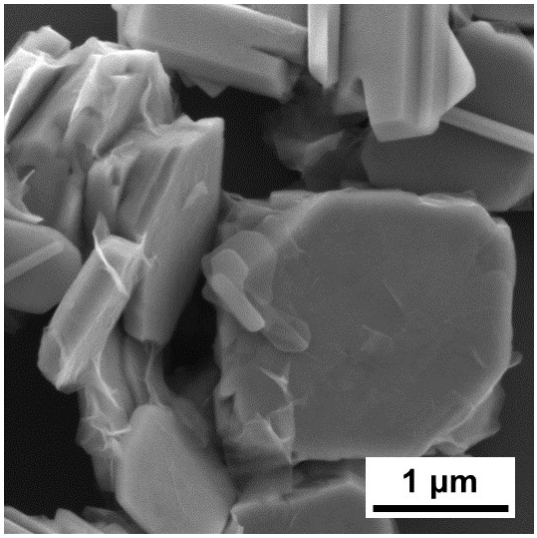

Figure S7 SEM image of the product obtained at 300 °C with the ratio of Nb : Sn being 2 : 8.

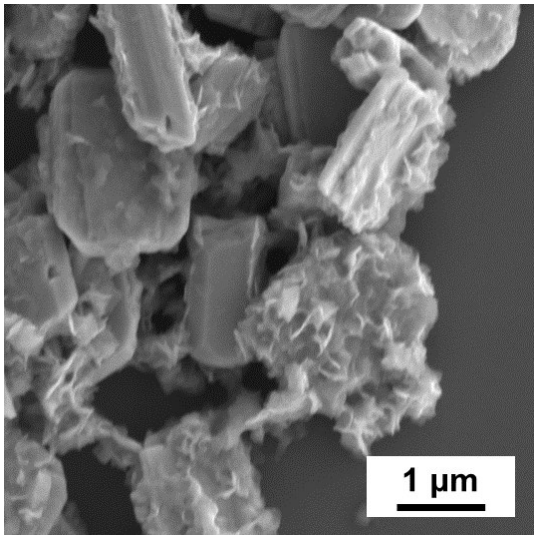

Figure S8 SEM image of the product obtained at 300 °C with the ratio of Nb : Sn being 4 : 6.

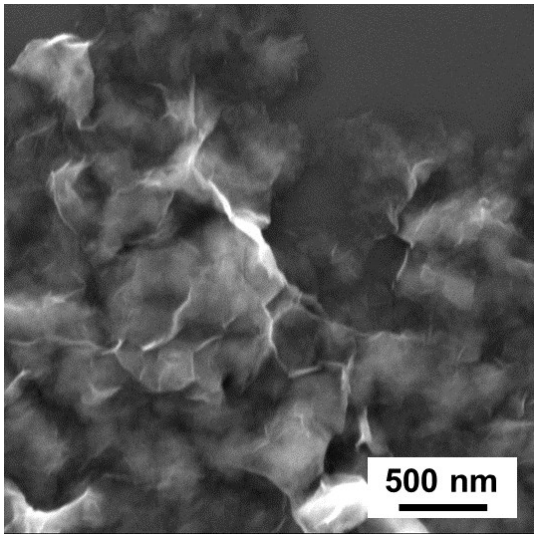

Figure S9 SEM image of as-prepared SnS/NbS_2 lateral heterostructures.

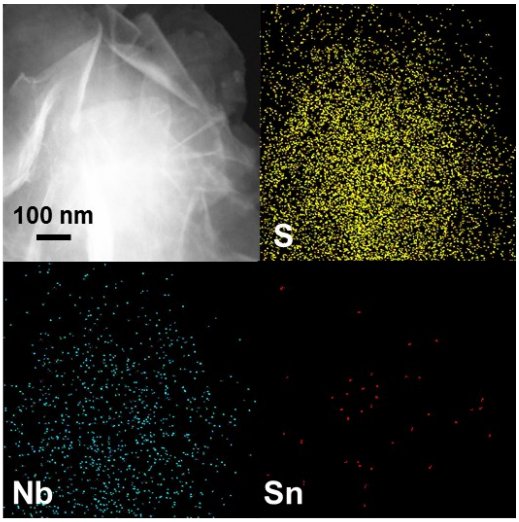

Figure S10 STEM image and EDX mapping of a typical SnS/NbS_2 lateral heterostructure.

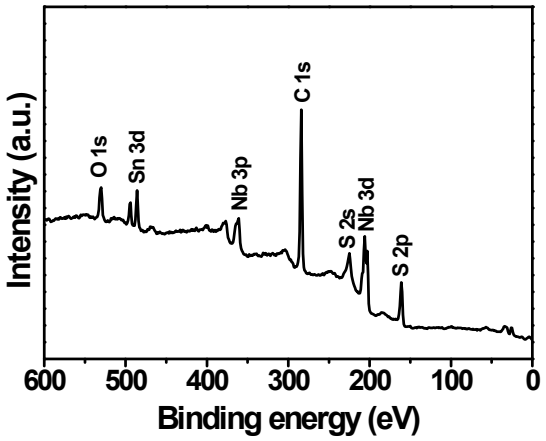

Figure S11 XPS full scan spectrum of the SnS/NbS_2 lateral heterostructures.

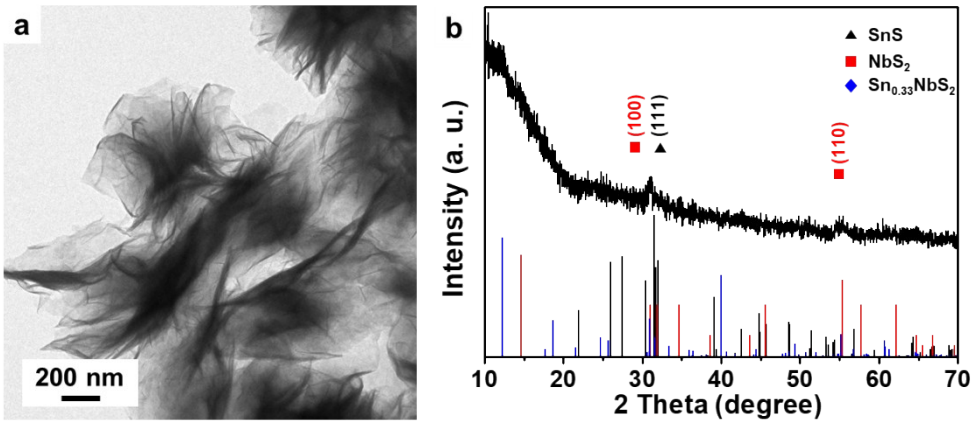

Figure S12 (a) TEM image and (b) XRD pattern of the product obtained at 320 °C for 3 h.

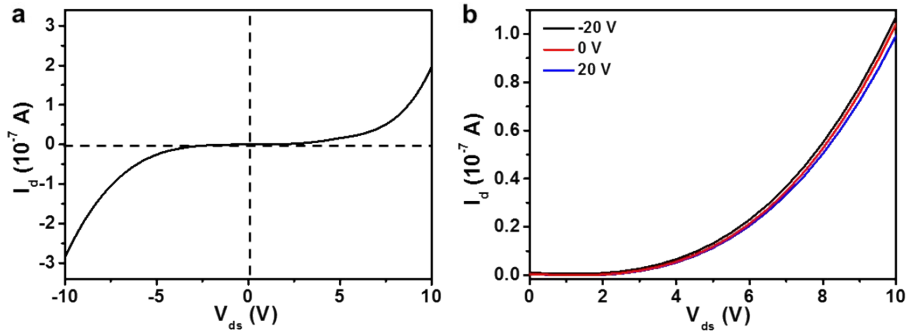

Figure S13 (a) Drain current (I_d) characteristics of back-gated thin film FETs based on SnS microplates for drain-source voltages (V_{ds}) varied from -10 to 10 V at 0 V gate voltage (V_g). (b) The I_d-V_{ds} curves of SnS microplates at various V_g from -20 to 20 V.

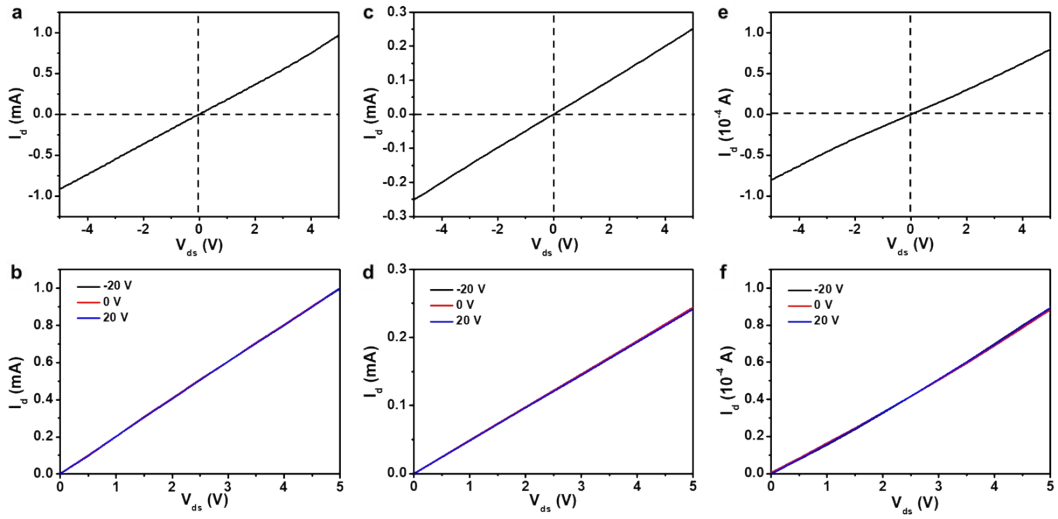

Figure S14 Drain current (I_d) characteristics of back-gated thin film FETs based on (a) NbS_2 nanosheets, (c) SnS/NbS_2 lateral heterostructures and (e) SnS@NbS_2 core@shell heterostructures for drain-source voltages (V_{ds}) varied from -5 to 5 V at 0 V gate voltage (V_g). The I_d-V_{ds} curves of (b) NbS_2 nanosheets, (d) SnS/NbS_2 lateral heterostructures and (f) SnS@NbS_2 core@shell heterostructures at various V_g from -20 to 20 V.

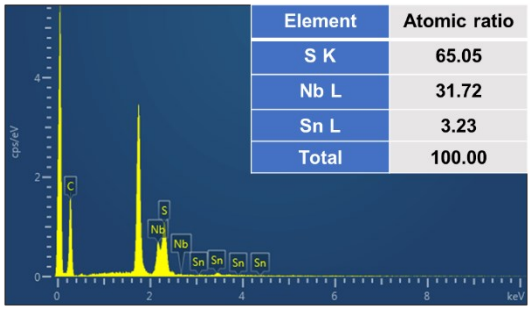

Figure S15 EDX spectrum of SnS/NbS_2 lateral heterostructures.

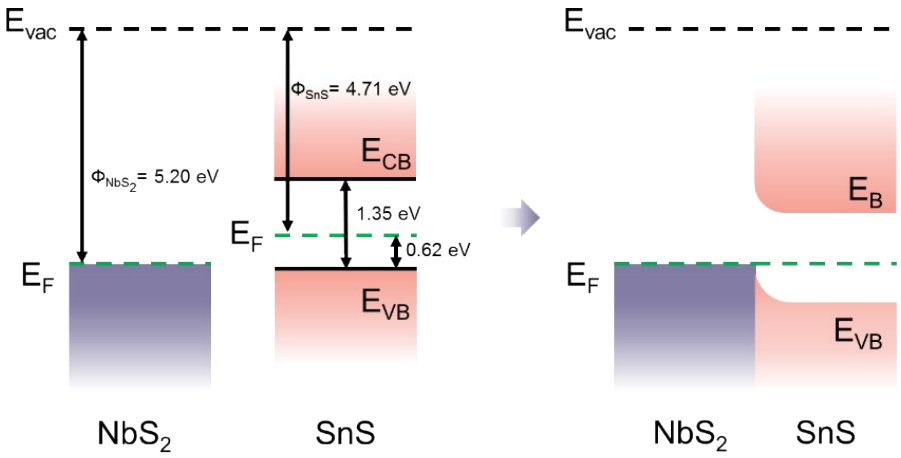

Figure S16 Schematic band alignment diagram for SnS and NbS_2 before and after contact. E_F, E_{CB}, and E_{VB} denote Fermi level, conduction band and valence band, respectively.

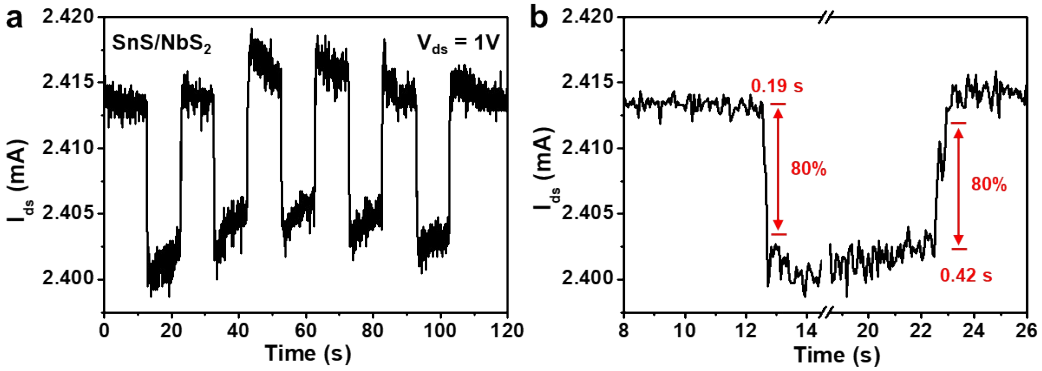

Figure S17 (a) Temporal photocurrent response and (b) a zoom-in view of the temporal photocurrent response of the photodetector based on SnS/NbS_2 lateral heterostructures. The light source used for all measurements was a 405 nm laser with a power of 3.52 mW.

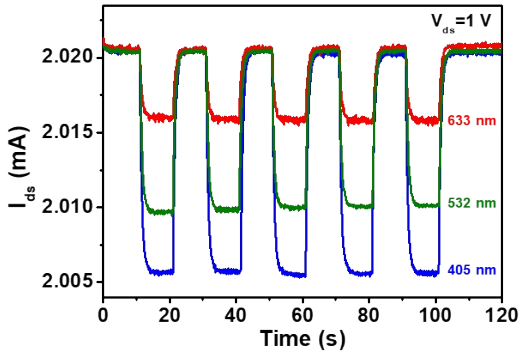

Figure S18 Temporal photocurrent response of $SnS@NbS_2$ core@shell heterostructures to lasers with different wavelengths (405nm, 532 nm and 633 nm).

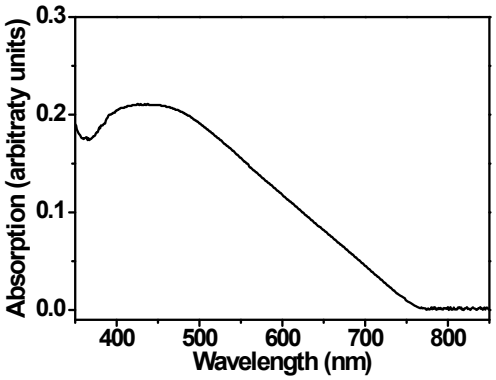

Figure S19 UV-vis absorption spectrum of NbS_2.