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Supporting information for

High-pressure enhanced coupling effect between the graphene electrical contacts and two-dimensional materials thereby improving the performance of their constitutes FET devices

Lijie Zhou,[aΔ] Chuanyang Ge,[bΔ] Huihui Yang,[c] Yi Sun,[b] and Jia Zhang*[b, c]

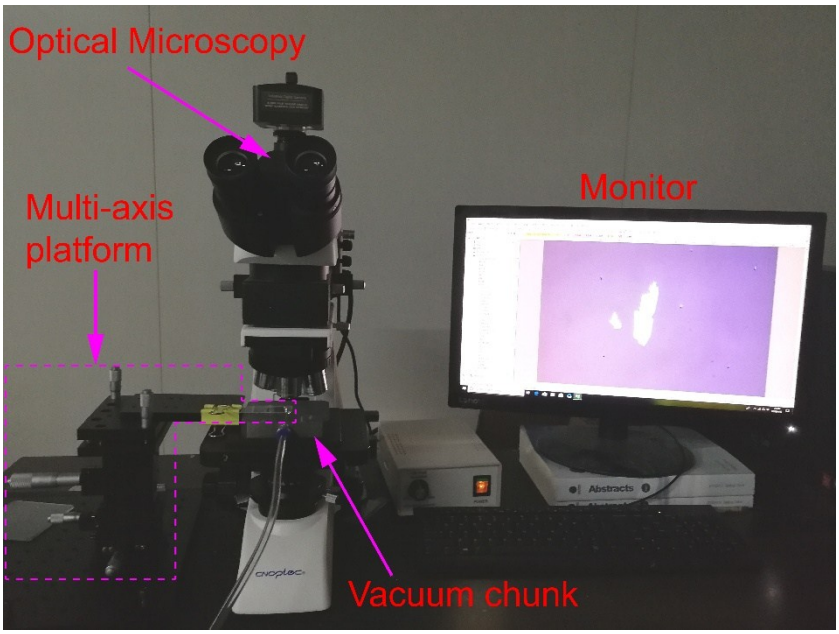

Fig. S1 Digital picture of home-made dry-transferring setup.

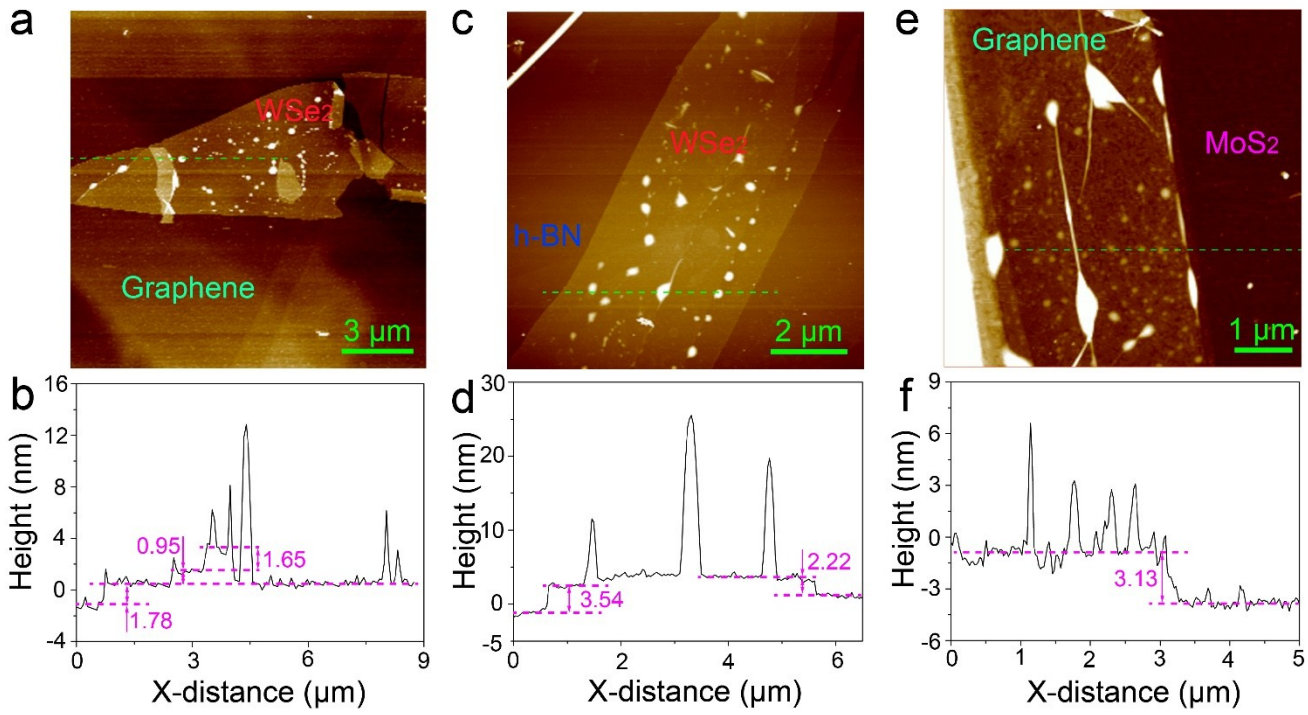

Fig. S2 AFM image of bubbles formed by transferring exfoliated 2D materials. (a) Multilayer WSe_2 on graphene, (c) Multilayer WSe_2 on h-BN, (e) Single layer graphene on MoS_2. (b, d, f) Corresponding profile of cross-section line marked in (a, c, e), respectively.

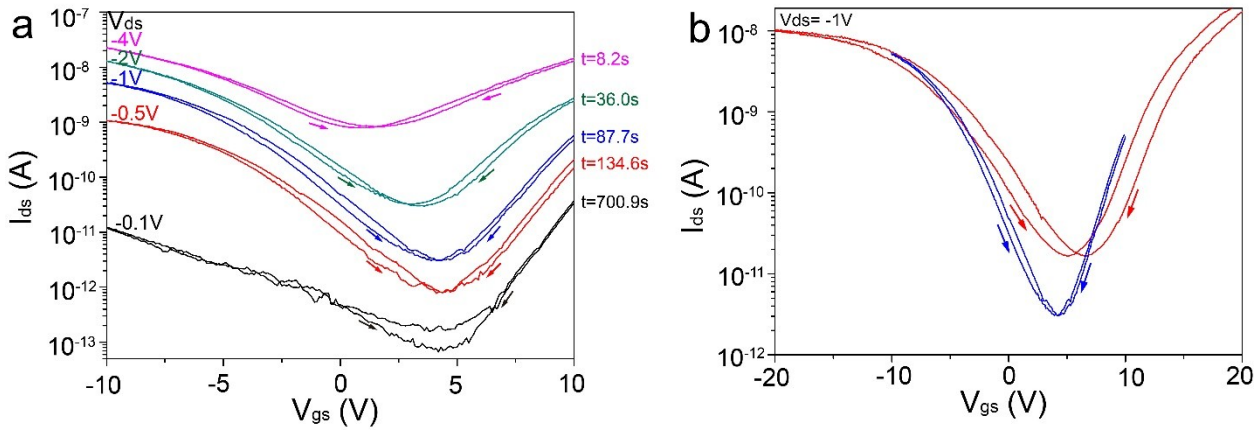

Fig. S3 Transfer properties of multilayer WSe_2 devices in air at room temperature. (a) Vgs-Ids of the device under dur- sweep of gate voltage from +10 V to -10V under various Vds. The time consumption is recorded, resulting in sweep rate of 0.06, 0.30, 0.46, 1.11 and 4.88 V/s for Vds=-0.1, -0.5, -1, -2 and -4 V, respectively. (b) Vgs-Ids of the device at the gate voltage sweeping from +20 to -20 V and +10 V to -10 V, respectively.

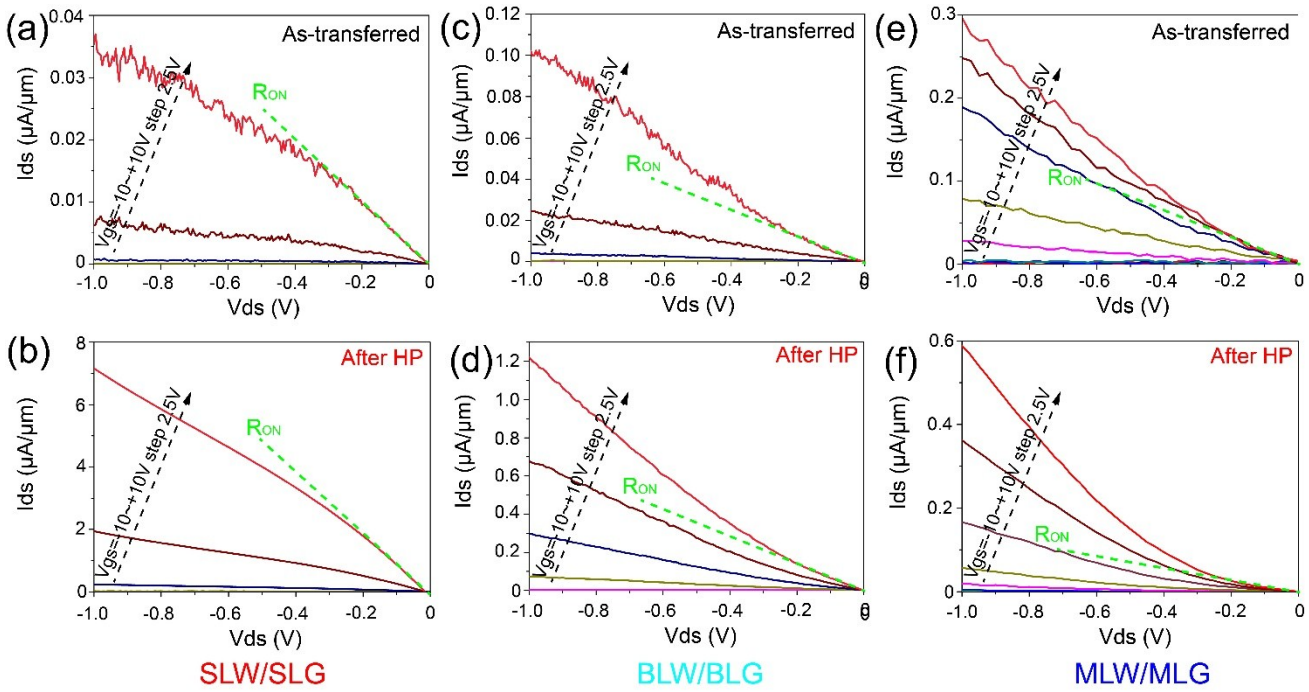

Fig. S4 The output (I_{ds}-V_{ds}) curves of SLW, BLW and MLW based FET device before and after HP treatment. (a, b), (c, d) and (e, f) are the I_{ds}-V_{ds} curves SLW, BLW and MLW based FET device before and after HP treatment, respectively. The back-gate voltage sweeps from -10 V to 10 V with a step of 2.5 V.

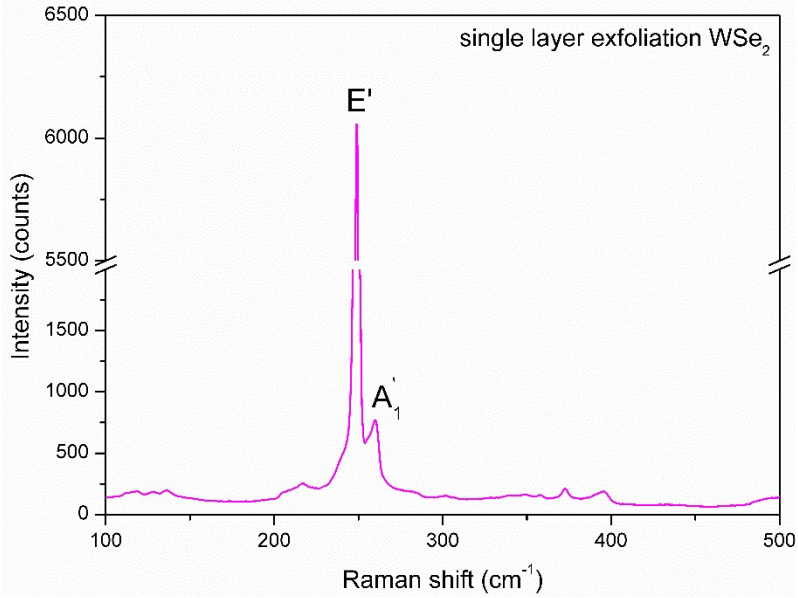

Fig. S5 Raman spectrum of single layer exfoliation WSe_2 flake

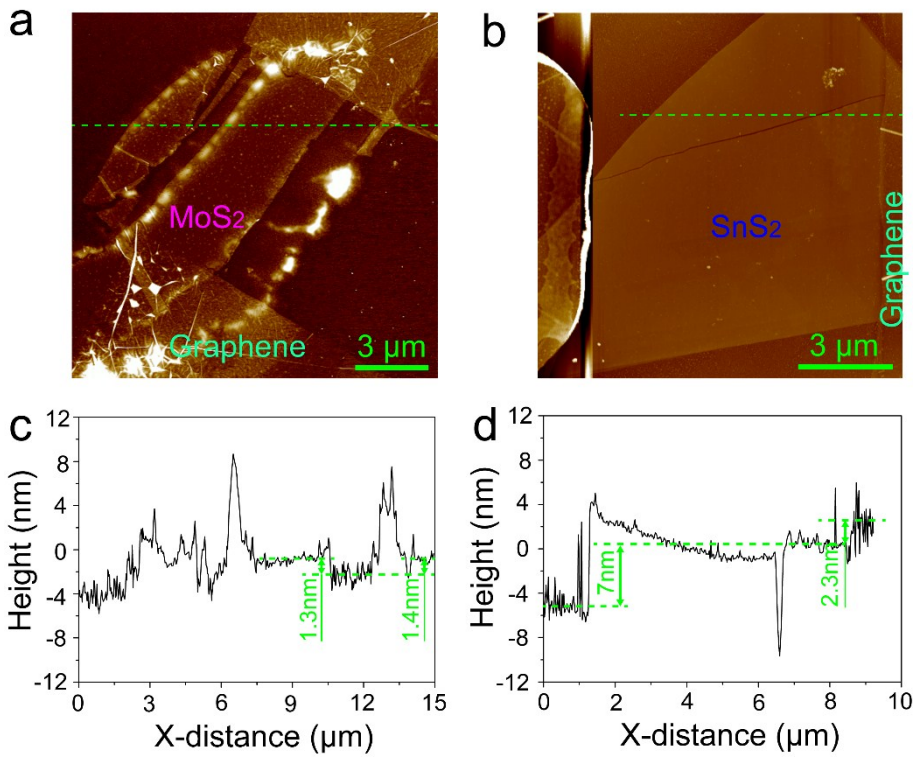

Fig. S6 AFM characterization of device structure. (a) AFM image of SLG/SLMo device. (b) MLG/MLSn device. (c) Profile of green dot line in (a), resulting the thickness of MoS_2 and graphene electrodes are 1.3 nm and 1.4 nm, respectively. (d) Profile of green dot line in (b), resulting the thickness of SnS_2 and graphene electrodes are 7 nm and 2.3 nm, respectively.

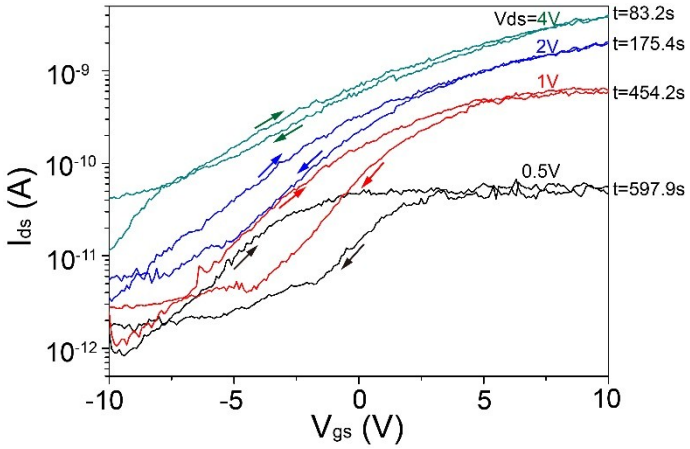

Fig. S7 Transfer properties (V_{gs}-I_{ds}) of multilayer SnS_2 devices in air at room temperature. The device was measured under sweeping gate voltage from -10 V to +10V and back to -10 V under various V_{ds}. The time consumption is recorded, resulting in sweep rate of 0.07, 0.09, 0.23 and 0.48 V/s for V_{ds}=0.5, 1, 2 and 4 V, respectively.