Supplementary Information

Synthesis and fast transfer of monolayer MoS_2 on reusable fused silica

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Experimental Section

Sample Preparation. Monolayer MoS_2 was synthesized by CVD in a three-zone furnace according to the procedures described previously.[29] MoO_3 (Alfa Aesar, 15mg) and S powder (ZNXC, 100mg) were used as Mo and S precursors with a distance of ~20cm. Ar was used as the carrier gas with a flow rate of 100sccm. The pressure maintains ~1000Pa during growth. The temperature for the central MoO_3 source ramped up to 750 °C in 60 min and maintained for 20 min. The temperature for the upstream sulfur source increased along with the MoO_3 temperature with a maximal of 250 °C.

Fast transfer technique. A thin layer of PMMA (~200nm) was spin-coated onto MoS_2/fused silica and cured for 10min at 150 °C. Then the PMMA/MoS_2/fused silica was immersed into 40% HF solution for 5s to detach the edge. After that the PMMA/MoS_2/fused silica was pulled out and gradually immersed into water within 10s. The PMMA/MoS_2 detached from the fused silica surface during the immersing process. At last, the clean desired substrate was used to scope out the PMMA/MoS_2. PMMA was removed in acetone after drying.

Characterization of MoS_2. Optical images are taken by Nikon LV100 POL, SEM images are obtained on S-4800, Hitachi, with an accelerating voltage of 3.0kV. The Raman and PL tests are performed on Ramanplus, Nanophoton with a 532 nm laser source. The crystalline structures are examined by TEM (JEM, 2100F, 200 kV). The AES measurements are carried out with a scanning Auger electron spectroscope (ULVAC-PHI model SAM650) equipped with a cylindrical mirror analyzer. The AES

spectra and area analysis are acquired with a primary electron beam of 10 kV and a takeoff angle of 42°. AFM images are obtained on Veeco 3D with a tapping mode.

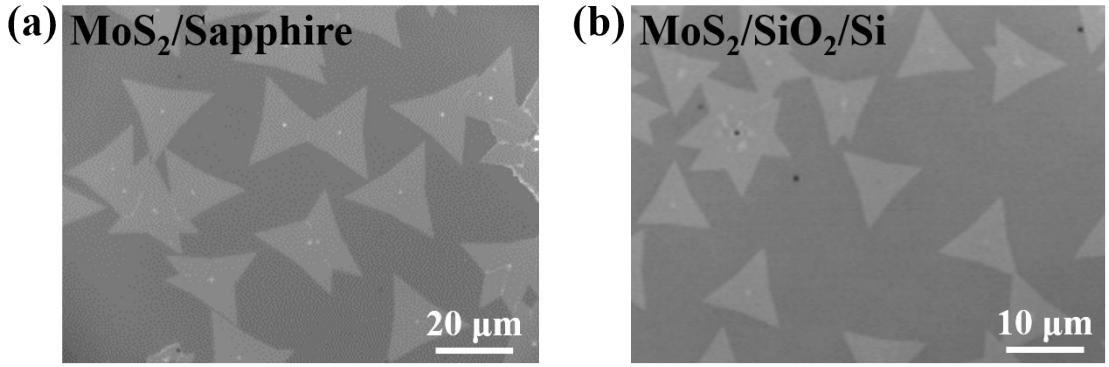

Fig. S1 Optical microscopy images of MoS_2 domains synthesized on (a) sapphire and (b) SiO_2(300nm)/Si substrates.

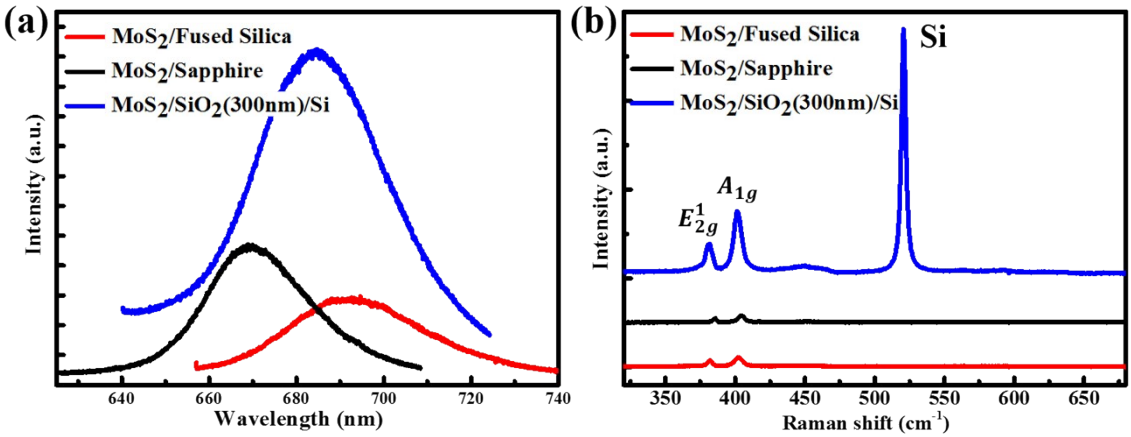

Fig. S2 (a) Raman and (b) PL spectra of MoS_2 domains synthesized on various substrates including fused silica, sapphire, and SiO_2(300nm)/Si.

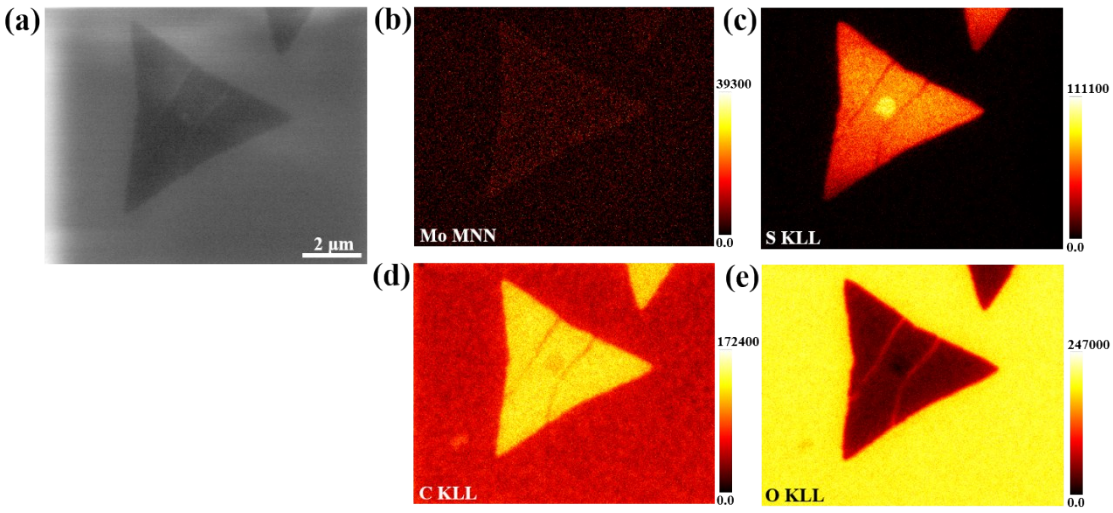

Fig. S3 AES characterization of a MoS_2 domain. (a) A secondary electron image of the sample showing the elements mapping region. (b) Mo MNN Auger electron map. (c) S KLL Auger electron map. (d) C KLL Auger electron map. (e) O KLL Auger electron map. The maps show the cracks clearly generated during the cooling stage of synthesis.