Supplementary Information

Remarkable quality improvement of as-grown monolayer MoS_2 by sulfur vapor pretreatment of SiO_2/Si substrate

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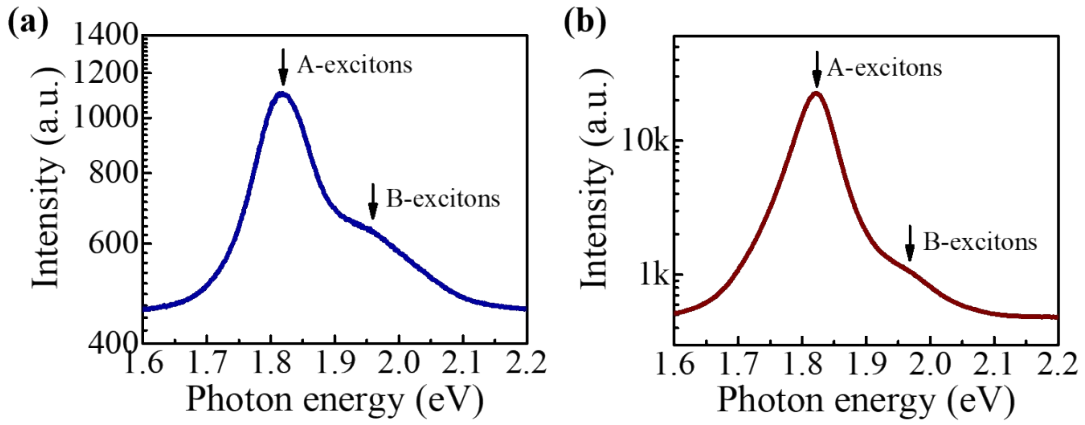

Figure S1 PL spectra of MoS_2 grown on untreated SiO_2/Si substrate (a) and sulfur vapor pretreated SiO_2/Si substrate (b) with intensity on a log-scale.

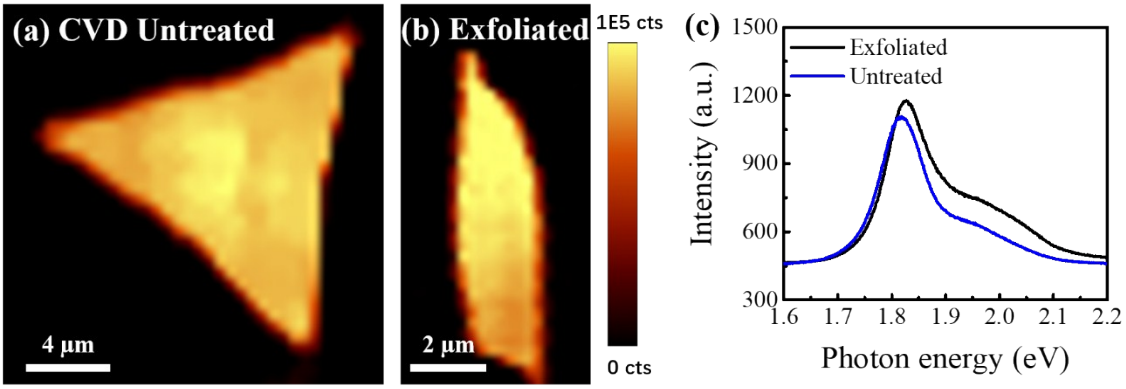

Figure S2. (a) PL peak intensity mapping of MoS_2 domain corresponding to Figure 1(b), it should be noted that the intensity scale bar in Figure 1(b) is twenty fold than that of Figure S1(a). (b) PL peak intensity mapping of mechanical exfoliated monolayer MoS_2. (c) Typical PL spectra extracted from (a) blue line, and (b) black line, respectively.

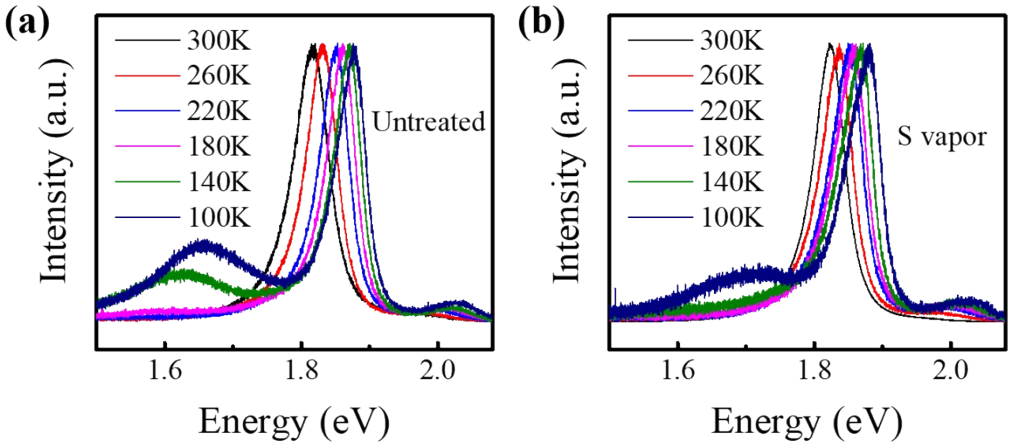

Figure S3. Temperature-dependent PL spectra of MoS_2 flake grown on untreated (a) and sulfur vapor pretreated (b) SiO_2/Si substrate. All the spectra are normalized by the intensity of the neutral exciton.

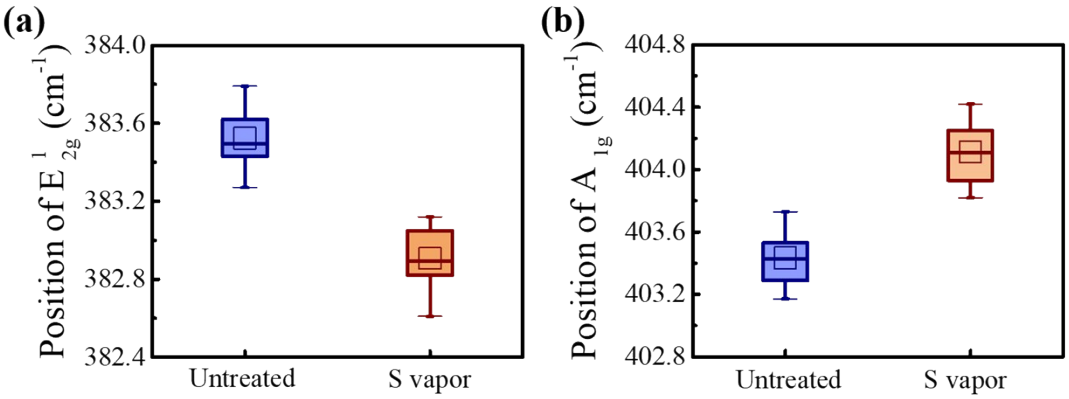

Figure S4 Statistic peak position of E1 2g (a) mode and A_{1g} (b) mode of MoS_2 grown on untreated and sulfur vapor pretreated SiO_2/Si substrate

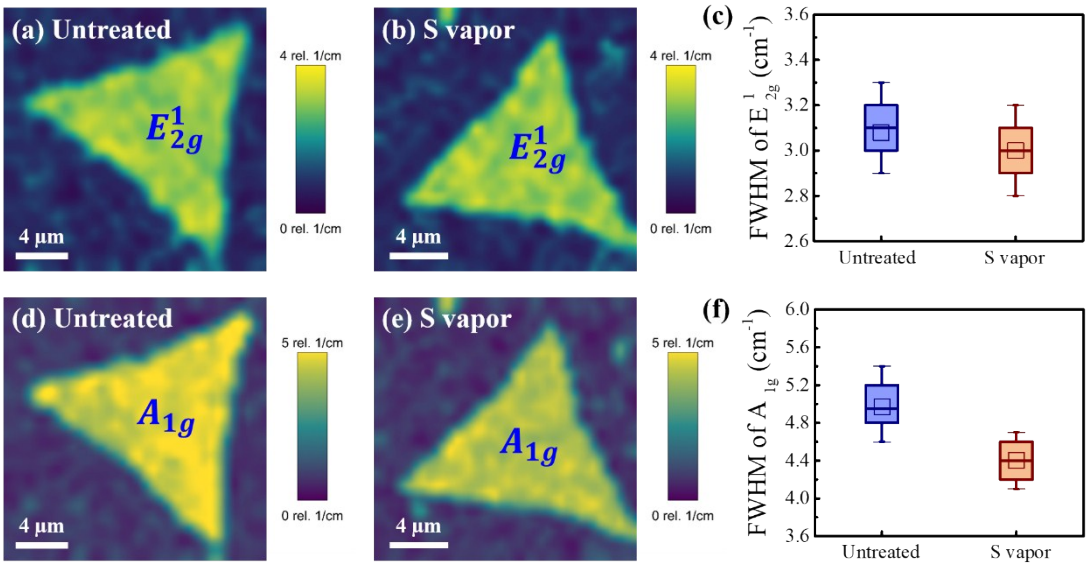

Figure S5. (a, b) Raman mapping of FWHM of E1 2g mode of MoS_2 domains corresponding to Figure 2(b) and 2(d), respectively. (c) The statistical results of peak width of E1 2g mode extracted from the mapping area of (a, b). (d, e) Raman mapping of FWHM of A_{1g} mode of MoS_2 domains corresponding to Figure 2(c) and 2(e), respectively. (f) The statistical results of peak width of A_{1g} mode extracted from the mapping area of (d, e).

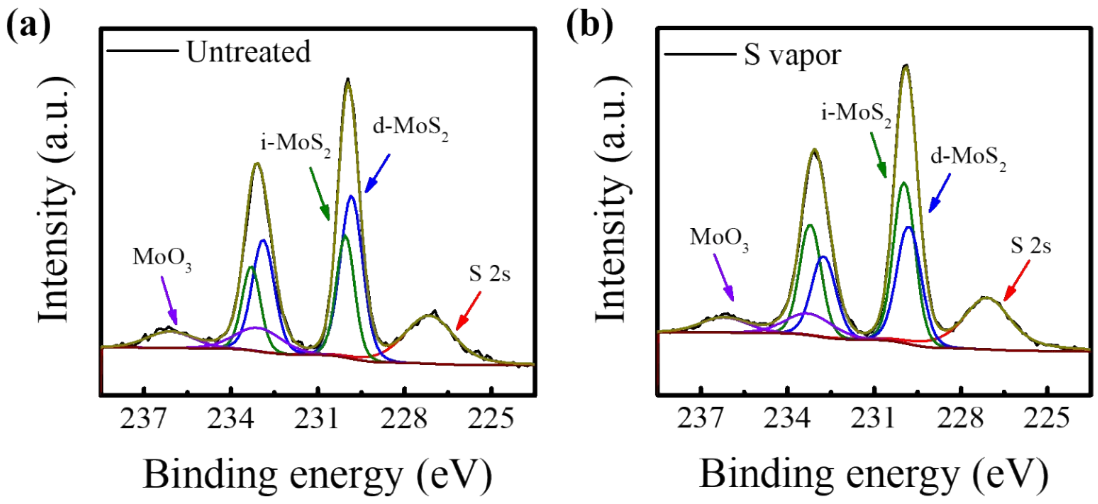

Figure S6. XPS spectra of Mo 3d and S 2s core levels of CVD grown MoS_2 on untreated SiO_2/Si substrate (a) and sulfur vapor pretreated SiO_2/Si substrate (b).

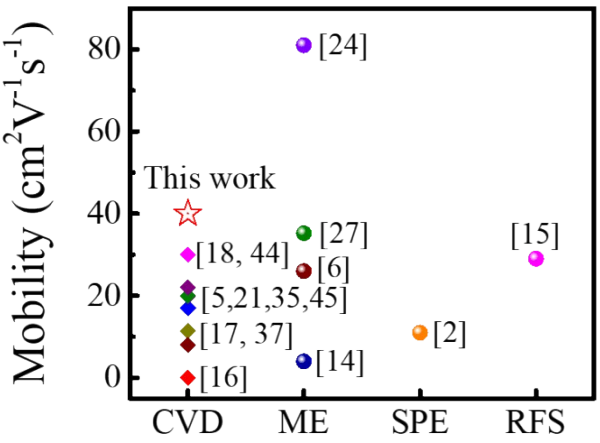

Figure S7. Statistics of mobility of MoS_2 in the corresponding references. Note: CVD (chemical vapor deposition), ME (mechanical exfoliation), SPE (solution-processable exfoliation), RFS (radio frequency sputtering).