Supplementary Materials

Strain engineering and lattice vibration manipulation of atomically thin TaS_2 films

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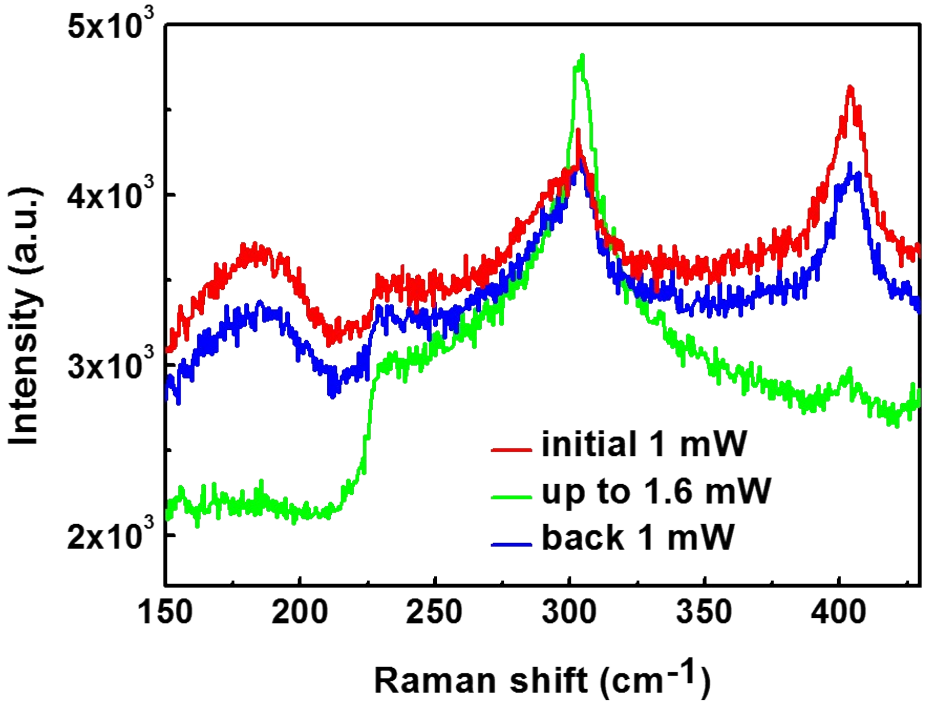

Figure S1: Raman spectra of the suspended 2H-TaS_2 flakes under different laser beam power values from 1 mW, 1.6 mW, and back to 1 mW. After irradiated under high laser beam power, the TaS_2 flake remains untainted, indicating the laser power of 1 mW used in the experiment introduces no additional destruction of the samples.

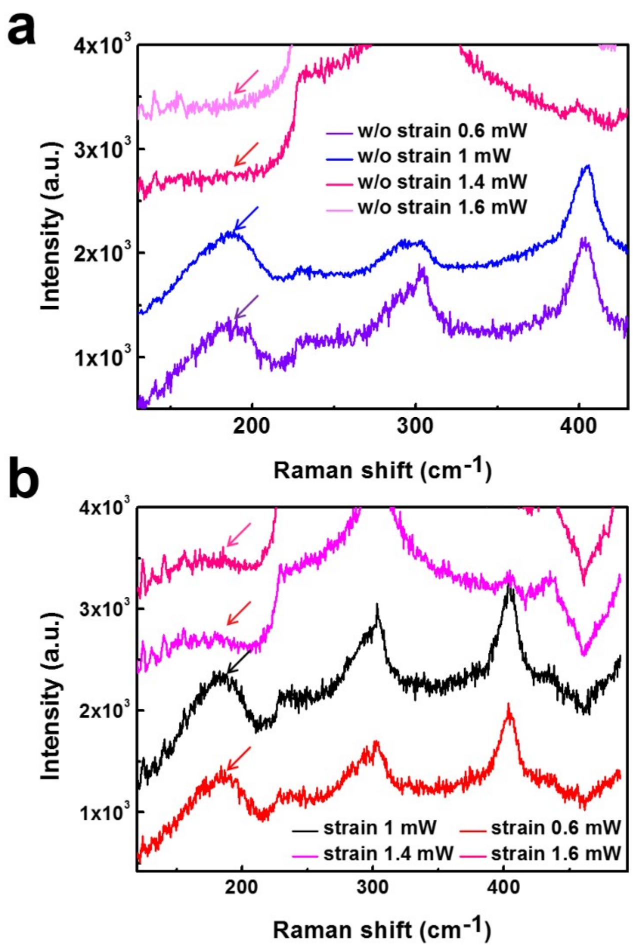

Figure S2: Raman spectra of 2H-TaS_2 under different laser beam power values with and without the compressive strain. (a) Irradiation power ranging from 0.8 mW to 1.6 mW, the two-phonon peak is suppressed above 1 mW, as indicated by the arrows. (b) Raman spectra collected on the strained 2H-TaS_2 flake. The two-phonon peak remains even above 1 mW, which is different from the unstrained samples. The two-phonon mode is enhanced with the compressive strain.

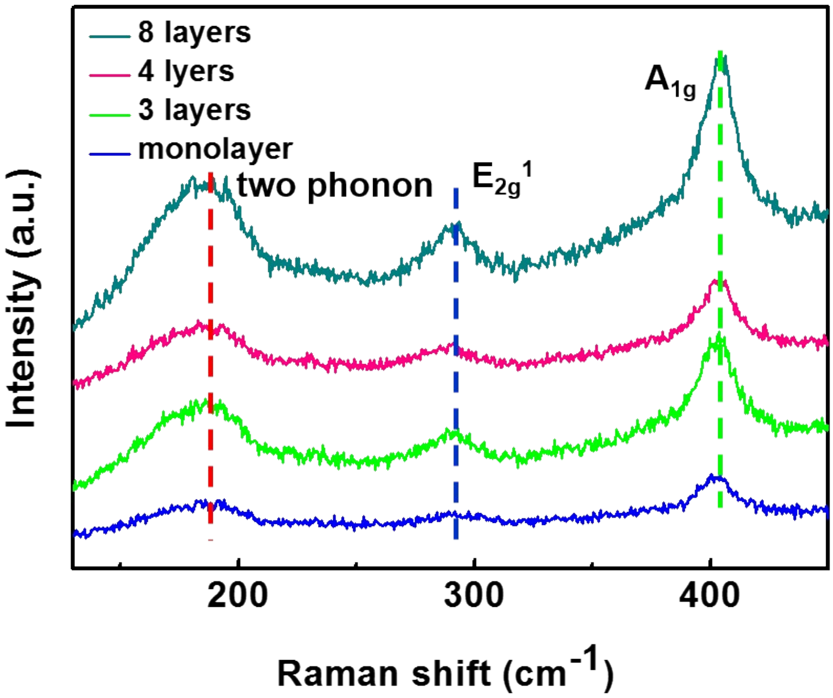

Figure S3: Thickness dependence of the unstrained 2H-TaS_2 flake. There is no obvious change in the E_{2g}^1 and A_{1g} as the thickness increases. In comparison to MoS_2, these two modes are highly thickness depended.

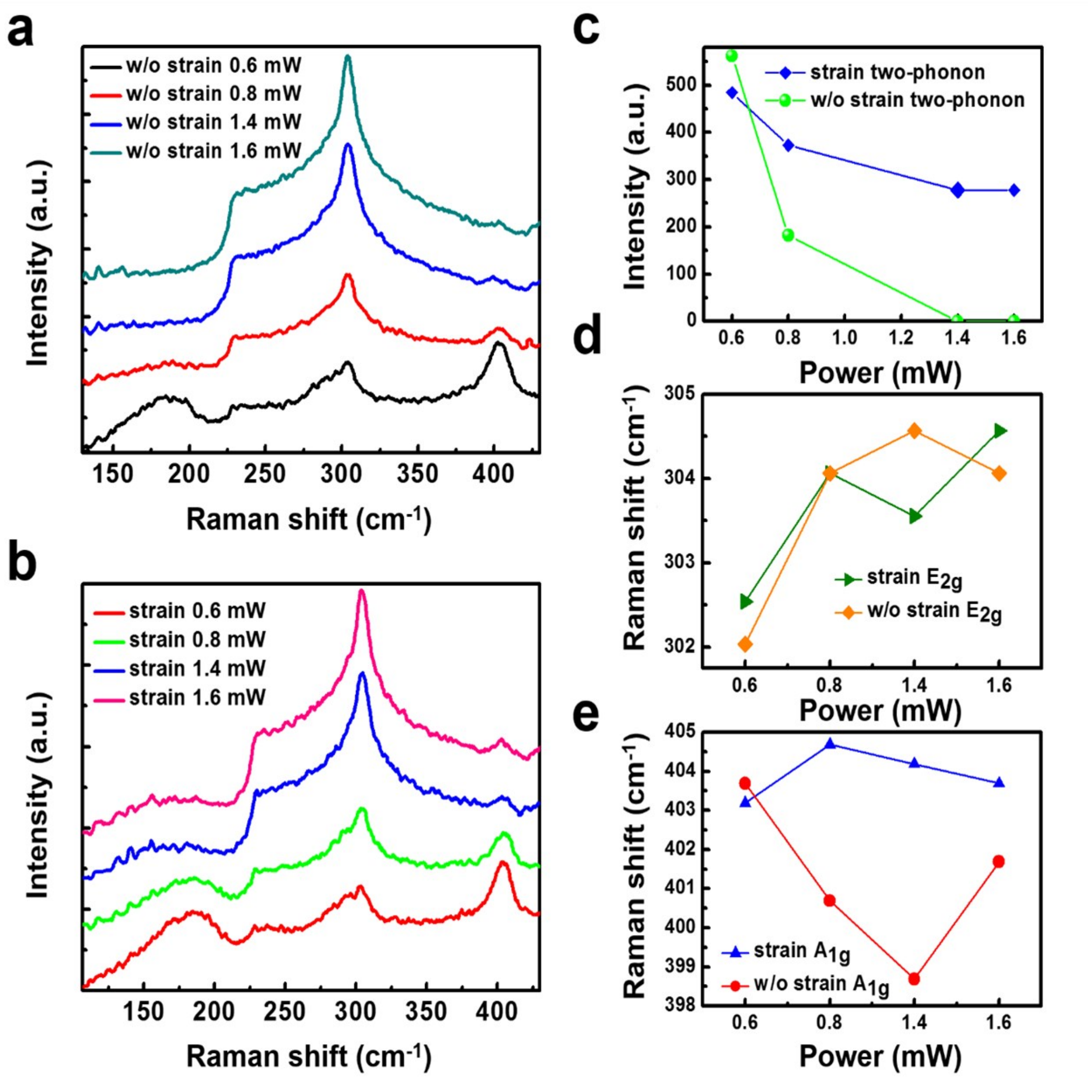

Figure 4. Raman characteristic of the suspended 2H-TaS_2 flake under different power of the laser beam:(a) without the compressive strain, and (b) with the compressive strain. Raman spectra of the two-phonon peak fade away with a high irradiation power of the laser beam. But the suspended 2H-TaS_2 flake impedes the phenomenon in (a). (c) Raman intensity of the two-phonon peak extracted from (a) and (b). (d) Raman shift of the (d) E_{2g}^1 peak, and (e) as a function of different powers of the laser beam.