

# Supplementary Information for “Visualizing Electronic Structure of Twisted Bilayer MoTe<sub>2</sub> in Devices”

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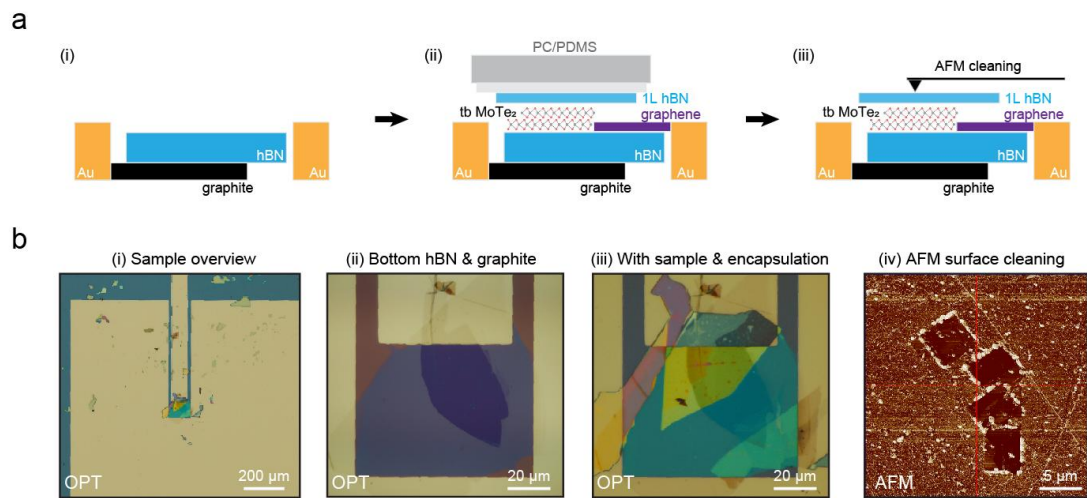
**Fig. S1 | Device fabrication procedures**

**Fig. S2 | Orbital components of monolayer MoTe<sub>2</sub> band structure**

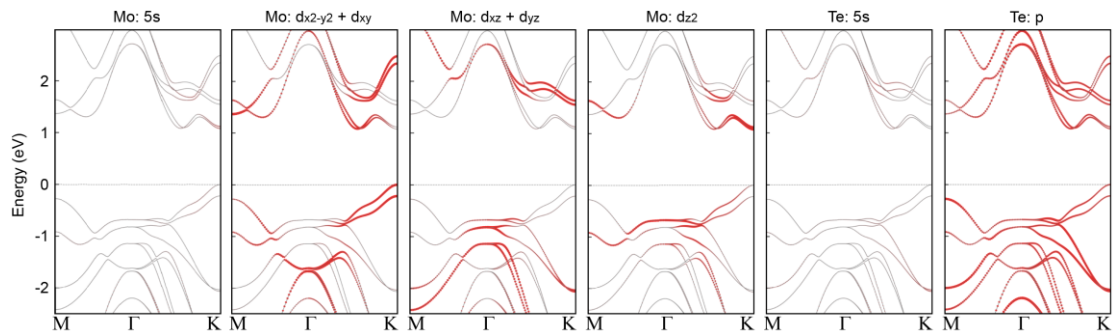
**Fig. S3 | Evolution of  $\Delta E_{\text{KT}}$  with changing parameters**

**Fig. S4 | ARPES spectra fitting**

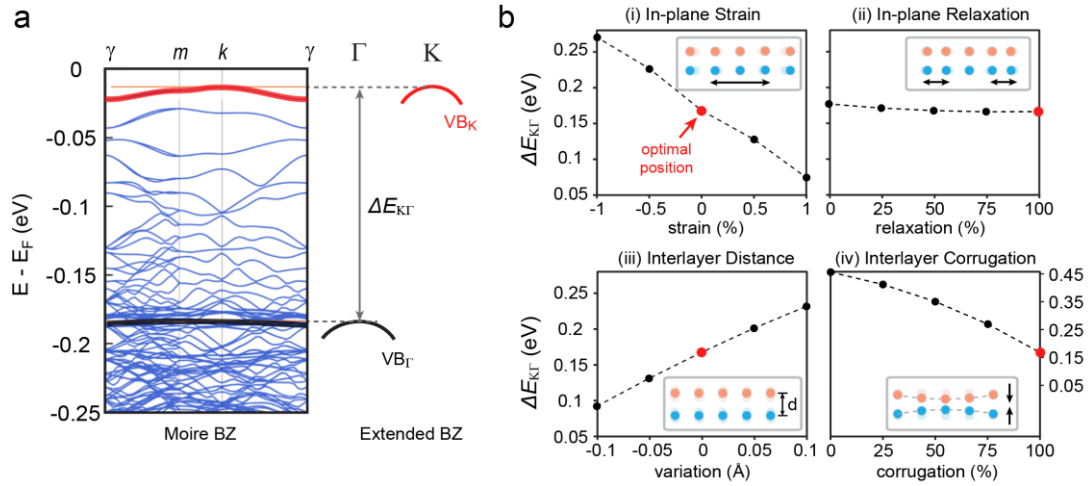
**Fig. S5 | Stability of the twist angle in tbMoTe<sub>2</sub> against annealing.**



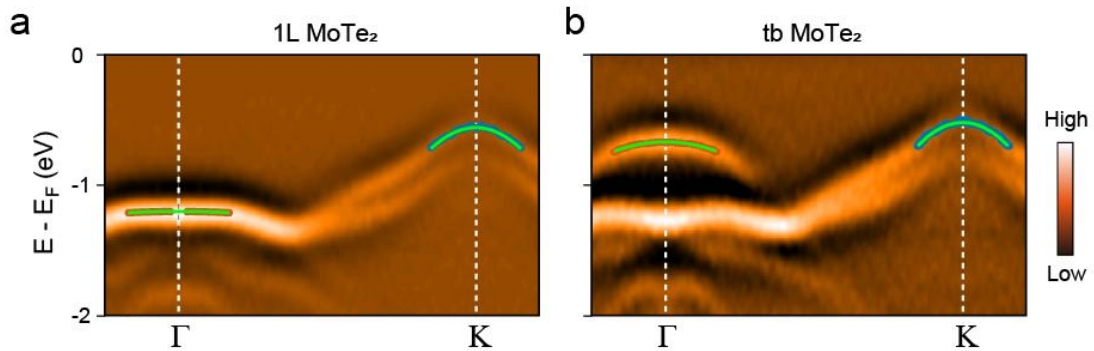
**Fig. S1| Device fabrication procedures.** **a**, Schematic of the device fabrication. (i) Graphite backgate and hBN flake were placed on the SiO<sub>2</sub>/Si substrate with pre-patterned gold electrodes. (ii) tb MoTe<sub>2</sub> sample with monolayer hBN (encapsulation) and graphene (grounding) was transferred using a PC/PDMS stamp. (iii) AFM was used to clean the polymer residue on the surface of the sample. **b**, (i-iii) Optical images of the sample. (iv) AFM image after the cleaning process.



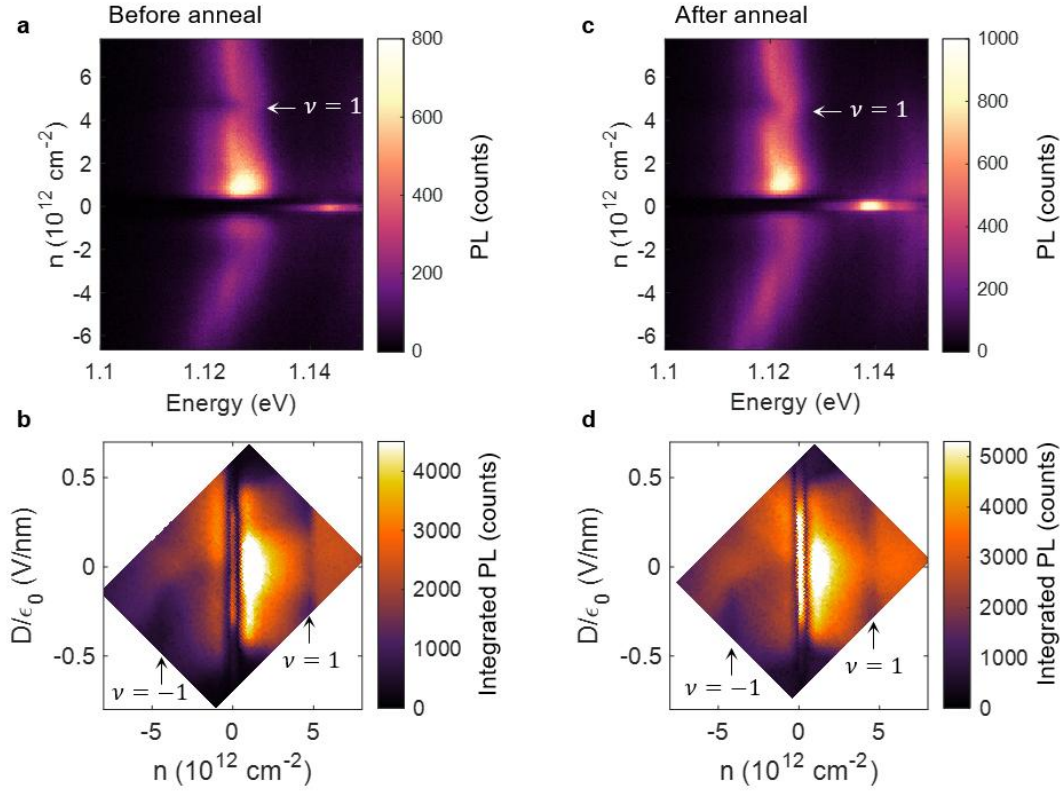
**Fig. S2| Orbital components of monolayer MoTe<sub>2</sub> band structure.**



**Fig. S3| Evolution of  $\Delta E_{K\Gamma}$  with changing parameters . a,** DFT moiré bands (MBs) of  $3.89^\circ$  tbMoTe<sub>2</sub>. The valence band top corresponding to  $\Gamma$  and K point in the extended BZ are highlighted in red and black lines, respectively. The energy difference between the valence band top is noted as  $\Delta E_{K\Gamma}$ . **b,** Evolution of  $\Delta E_{K\Gamma}$  as a function of intralayer relaxation and in-plane strain effect. The result indicates that the valence band maximum always locates at the K point.



**Fig. S4| ARPES spectra fitting.** Dispersions of the valence band top at both  $\Gamma$  and K point were extracted by finding the peak positions in the second derivative plot of the original ARPES spectra. These band dispersions were then fitted with a parabolic model  $E = \frac{\hbar^2(k-k_0)^2}{2m^*} + E_0$ , where the in-plane effective mass  $m^*$  along  $\Gamma$ -K adirection can be obtained.



**Fig. S5| Stability of the twist angle in tbMoTe<sub>2</sub> against annealing.** **a**, Photoluminescence (PL) intensity as a function of photon energy and carrier density. The discontinuity of the trion state marks the moiré filling factor  $\nu = 1$ . **b**, Integrated PL intensity as a function of both carrier density and displacement field, where the  $\nu = 1$  state is more prominent. **c-d**, PL result same as **a-b**, but after annealing at 220 °C for 3h. The  $\nu = 1$  state is observed at the same location, indicating the stability of the twist angle of tbMoTe<sub>2</sub> device against annealing.