

Supplementary Materials for

Memristive effects within stacking faults consisting of locally-coexisting rhombohedral and Bernal lattices in exfoliated graphite and multilayered carbon nano-onions

Hansong Wu^a, Li Lei^b, Shanling Wang^c, Hong Zhang^{a**} and Filippo S. Boi^{a*}

^a *College of Physics, Sichuan University, Chengdu China.*

^b *Institute of Atomic and Molecular Physics, Sichuan University, Chengdu, China*

^c *Analytical and Testing Centre Sichuan University Chengdu China.*

Email first corresponding author:* f.boi@scu.edu.cn;

*Email second corresponding author**:* hongzhang@scu.edu.cn

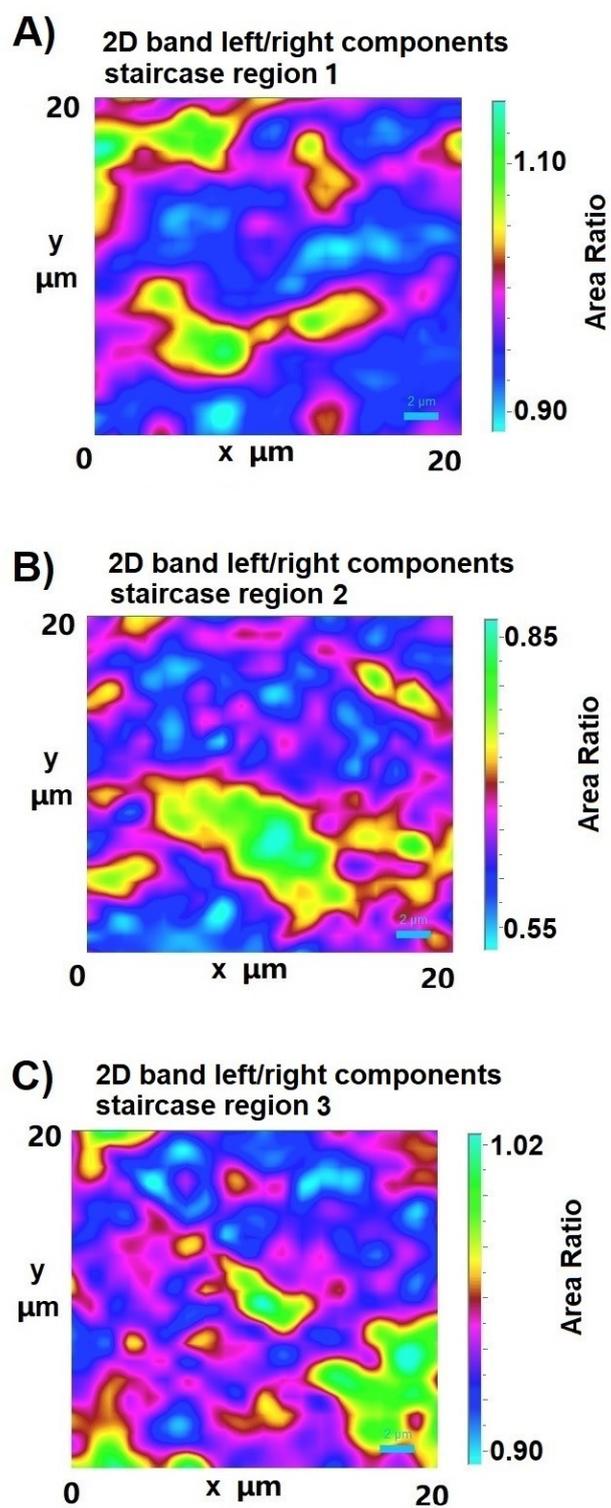


Fig.S1: Raman mapping analyses (A,B,C) revealing an anomalous enhancement of the signal contribution (area) from the left portion of 2D band, which is indicative of coexisting rhombohedral and Bernal stacking order.

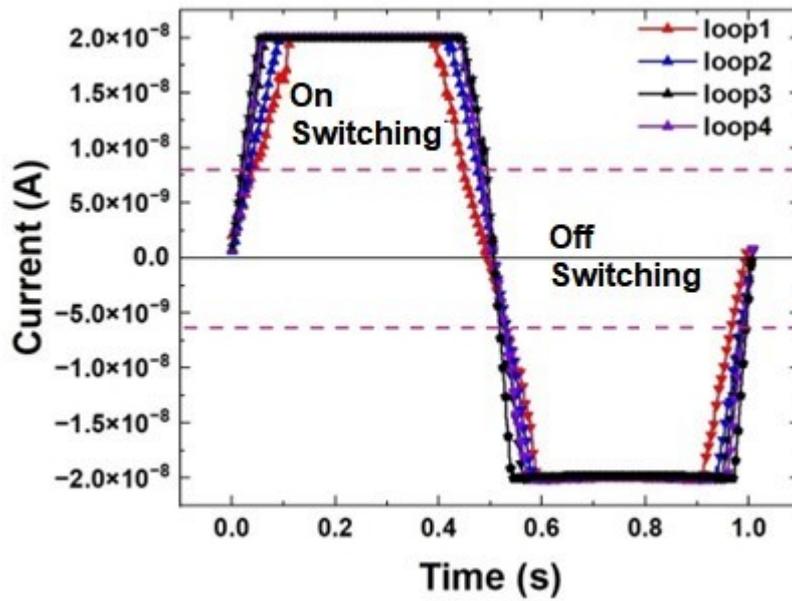
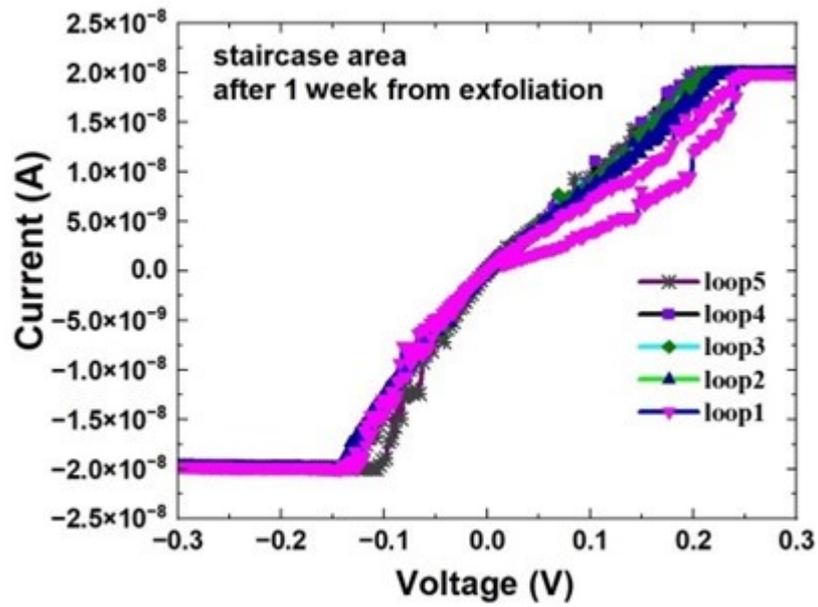


Fig.S2: Current vs voltage and Current vs Time curves acquired from a staircase stacking-fault after 1 week from the first exfoliation.

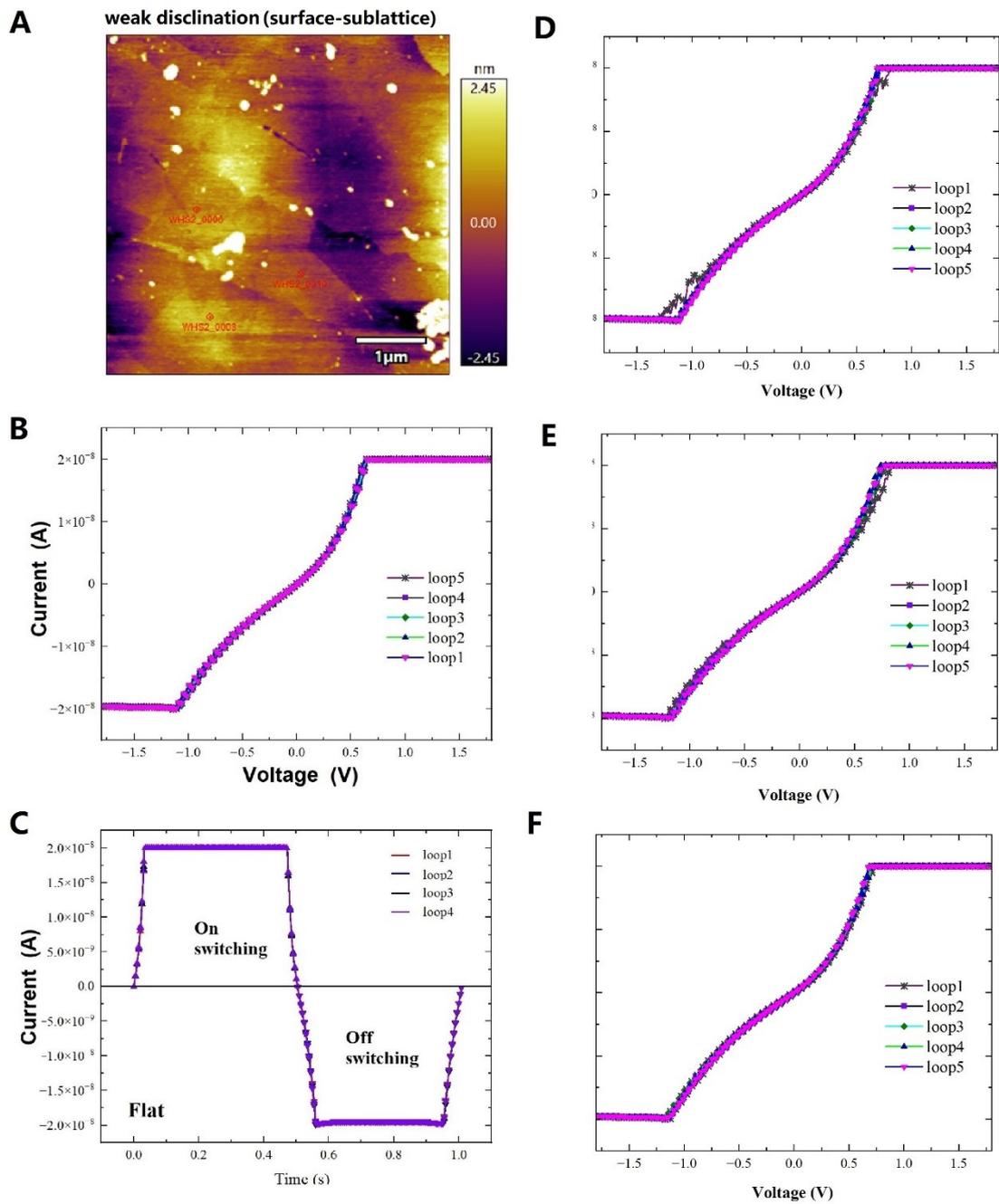


Fig.S3: AFM image (A) representative of a lamella region exhibiting a weak-disclination morphology. In B-F, the resistance switching measurements are shown through current vs voltage (B, D, E, F) and current vs time (C) plots.

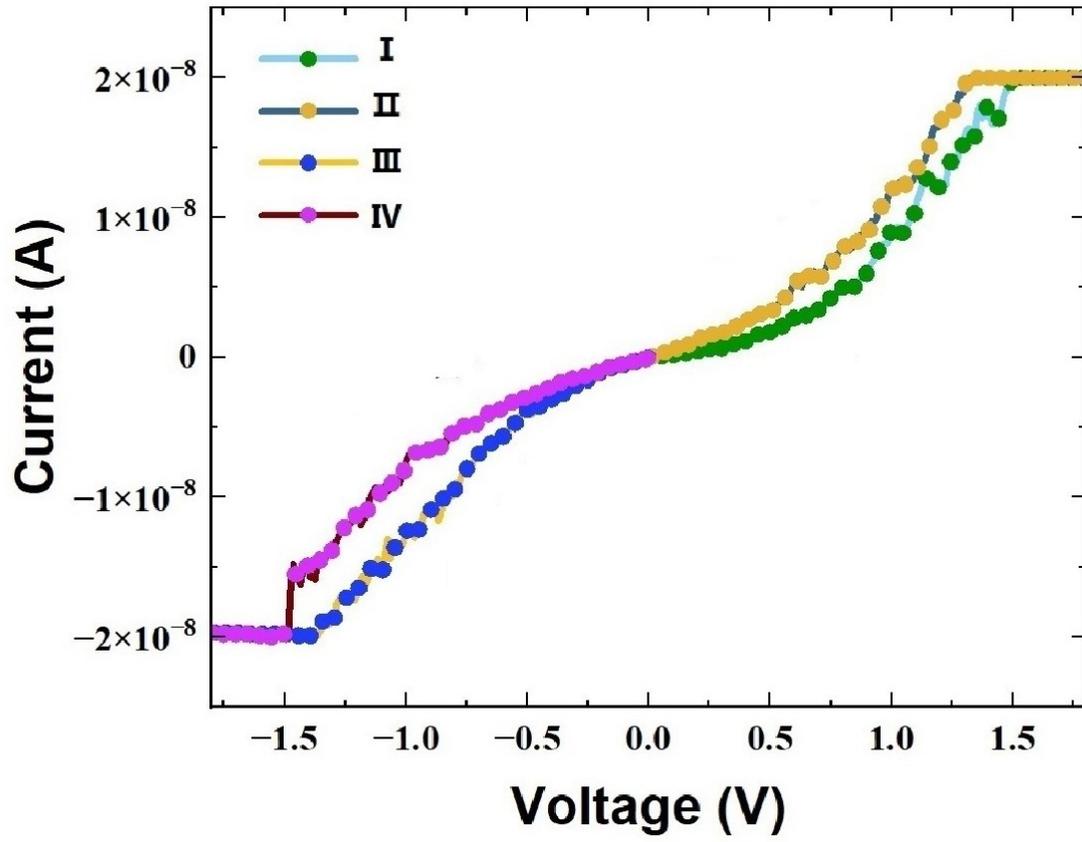


Fig.S4: Typical pinched hysteresis observed in AFM current vs voltage measurements, within stacking-faults comprising of coexisting rhombohedral and Bernal lattices.

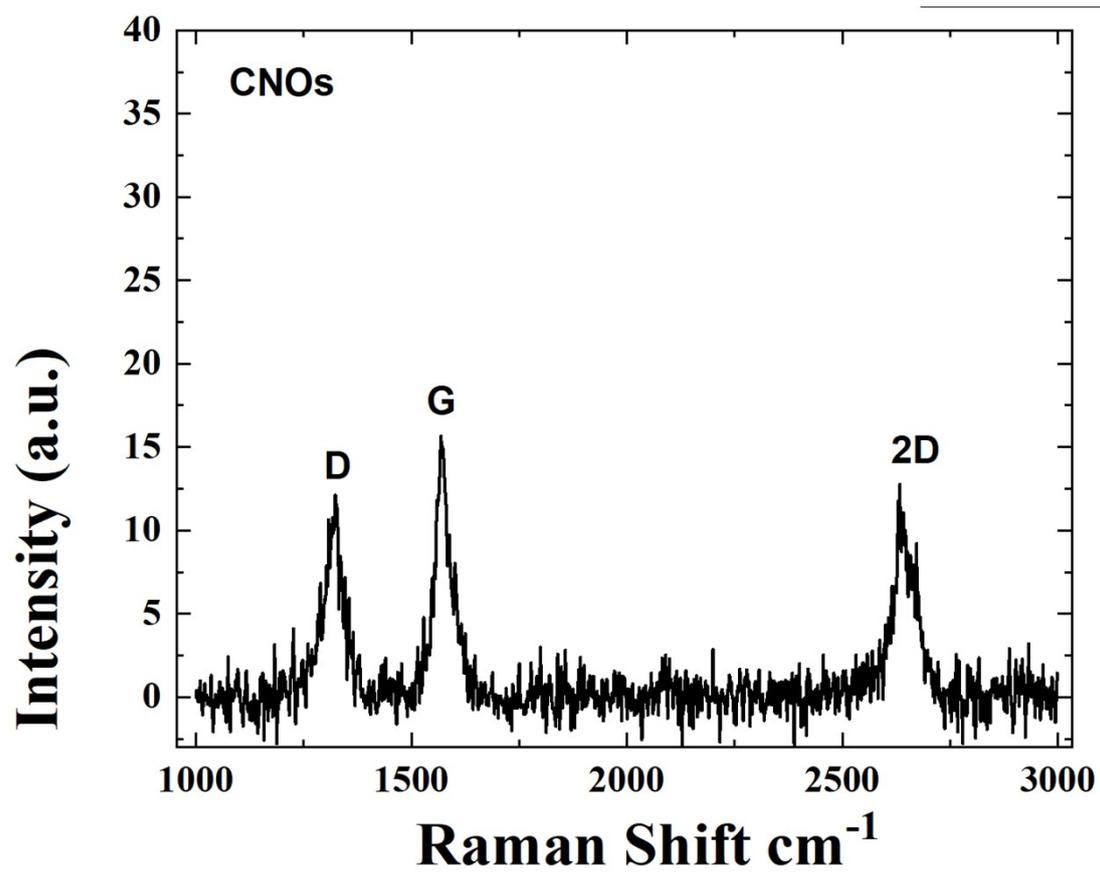


Fig.S5: Typical Raman spectroscopy signal acquired from a film of filled CNOs.

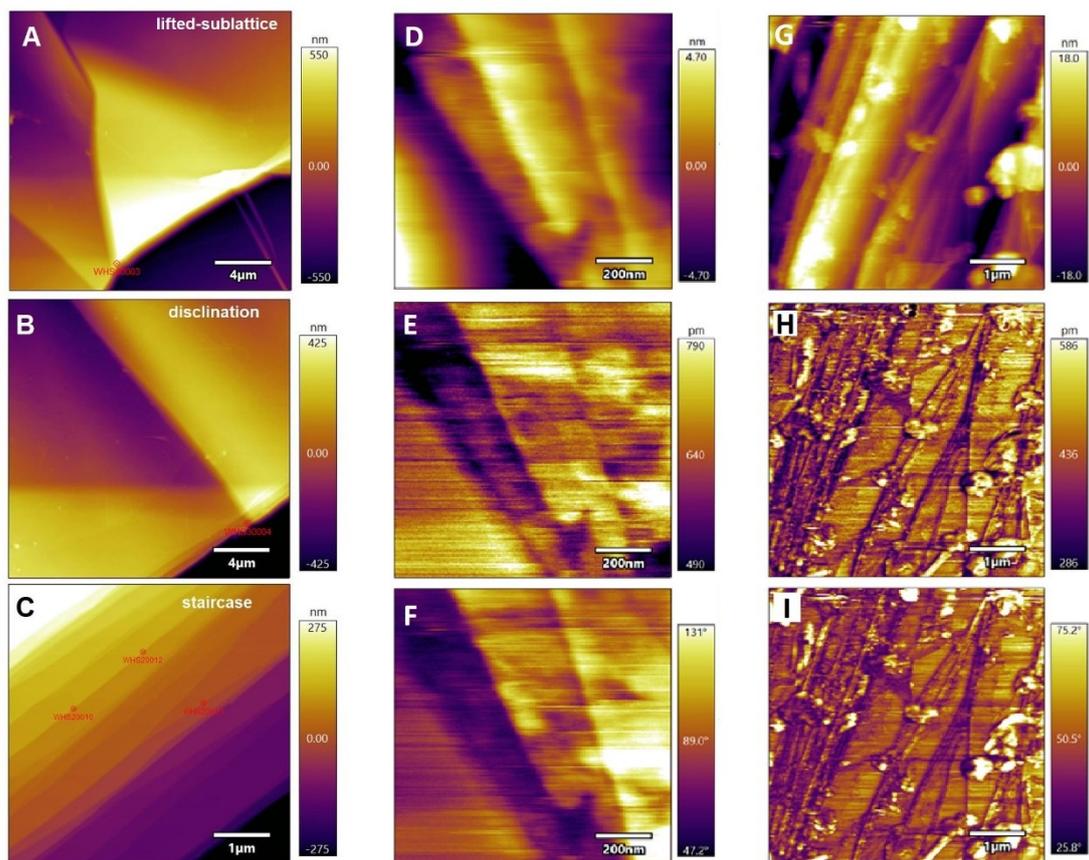


Fig.S6: AFM images (A,B,C) of typical stacking-faults consisting of lifted, disclination, and staircase lattice-defects generated by exfoliation in HOPG. In D-I, the PFM amplitude (E,H) and phase (F,I) maps reveal absence of clear local ferroelectric ordering within the analysed stacking-faults, which consist of coexisting rhombohedral and Bernal lattices.

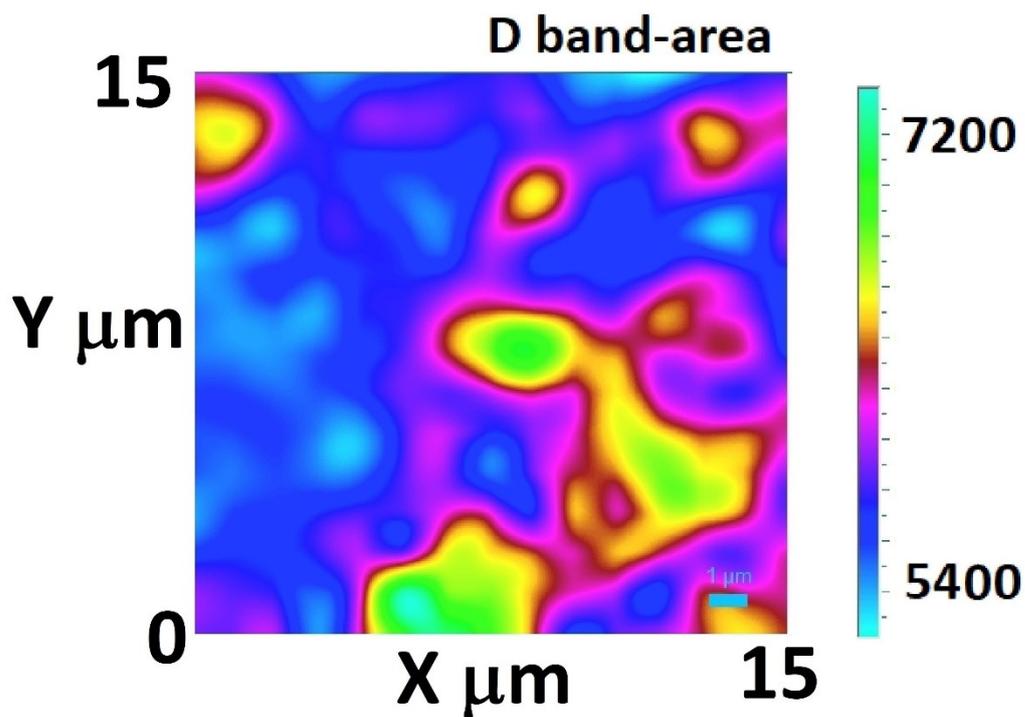


Figure S7: Raman map exhibiting the spatial variation of the area of the D band in a as grown CNO sample. It is noticeable the presence of a local enhancement of the D band in certain regions of the film.

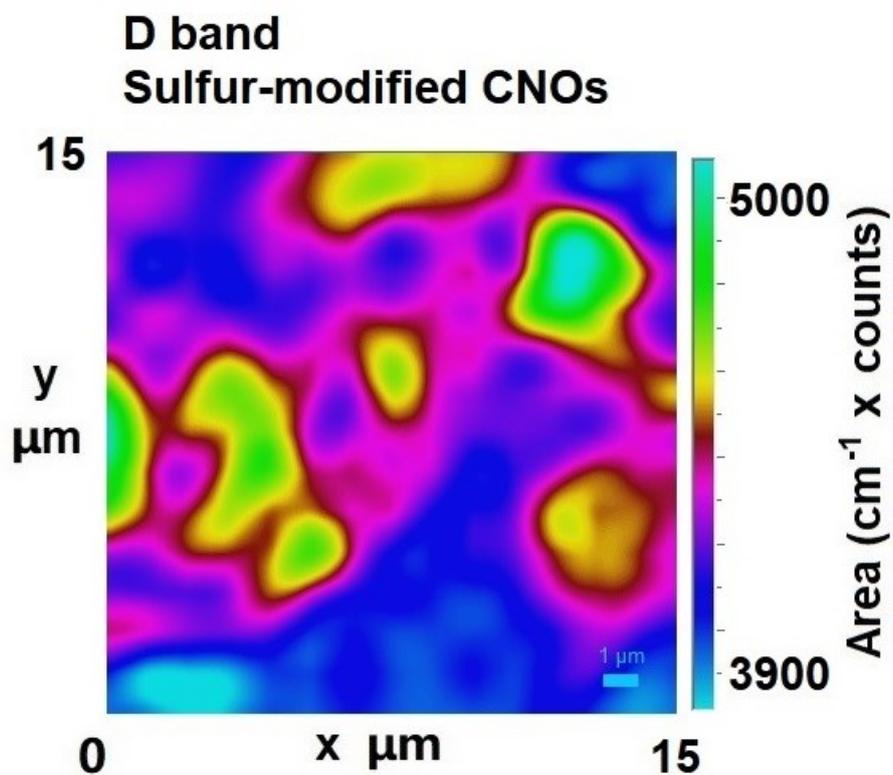


Figure S8: Raman map exhibiting the spatial variation of the area of the D band in a S-modified CNO sample. This measurement evidences a depletion in the area of the D band.

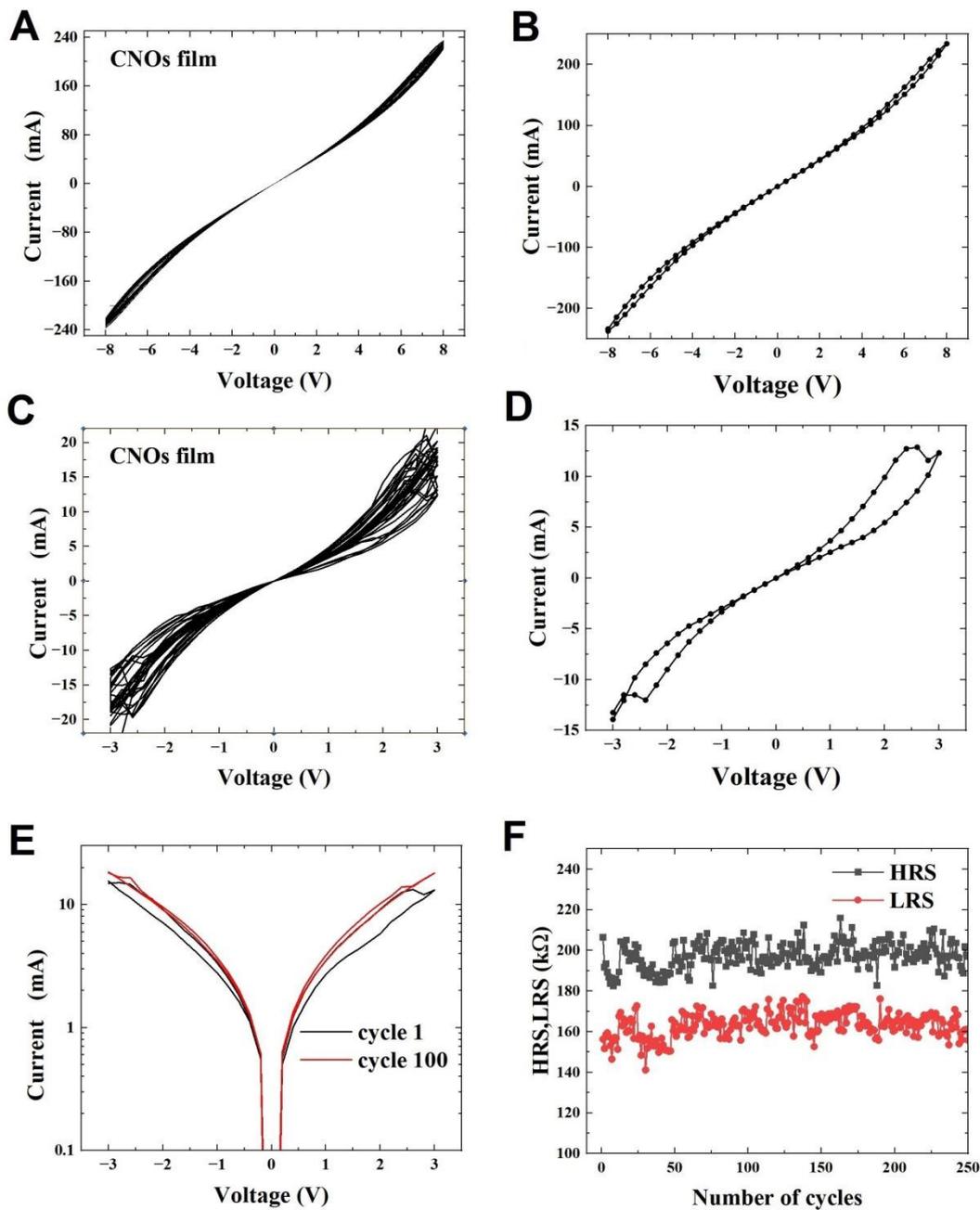


Figure S9: As shown in A, C, the cycle to cycle measurements under the high reading voltage of 8V(A) and the low reading voltage of 3V (C) are presented during 100 repeated cycles on the CNOs film. The typical current vs voltage curves exhibited in B and F respectively shows a clear memristive effect. As shown in E, the hysteresis resistive switching behavior still remains after 100 times sweeping, which indicated the potential stability and reproducibility of the CNOs film memristor prototype. In F, the resistance of HRS and LRS is shown to investigate the switching stability of the CNOs film at a read voltage of 5 V, a reset voltage of -5V and a write voltage of 1V.

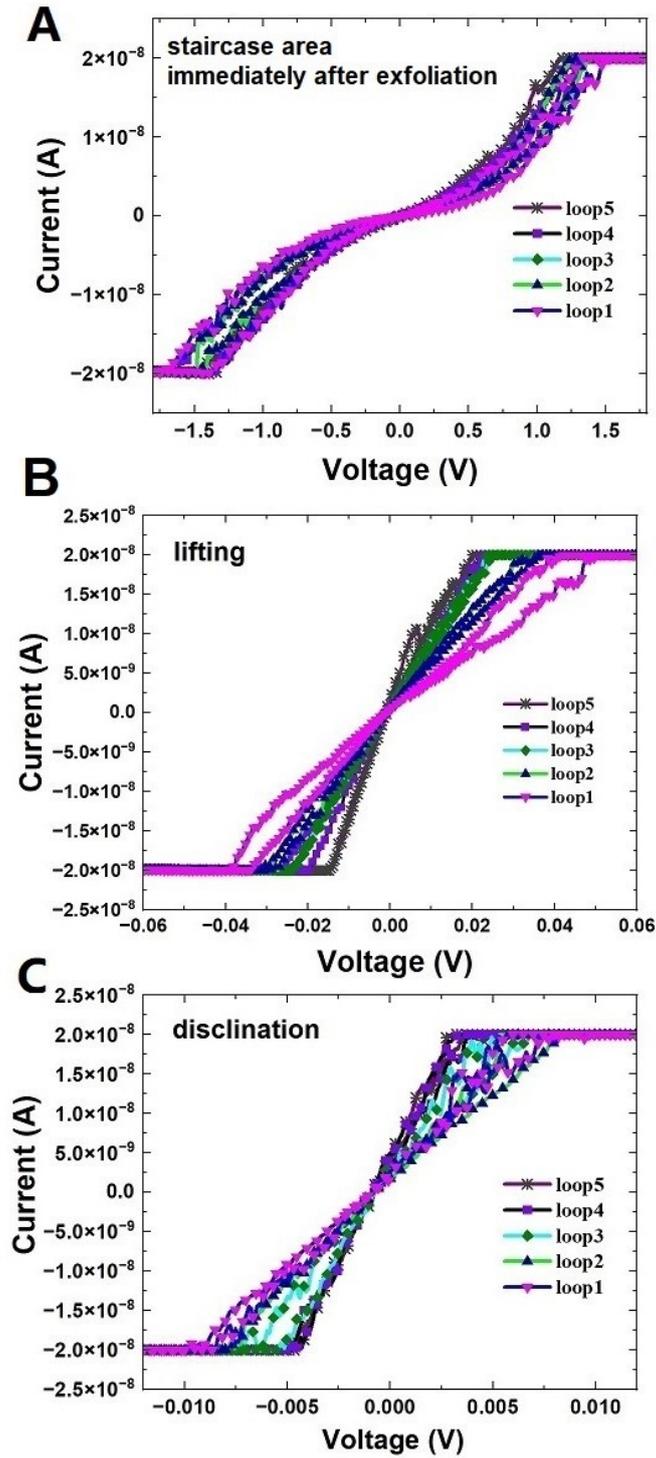


Figure S10: AFM current-voltage curves (A,B,C) exhibiting a typical pinched hysteresis resistive switching behavior within staircase, lifting and disclinations defective regions of exfoliated HOPG.