Supporting information

Characterization of interfacial barrier charging as resistive switching mechanism in $Ag/Sb_2Te_3/Ag$ heterojunction

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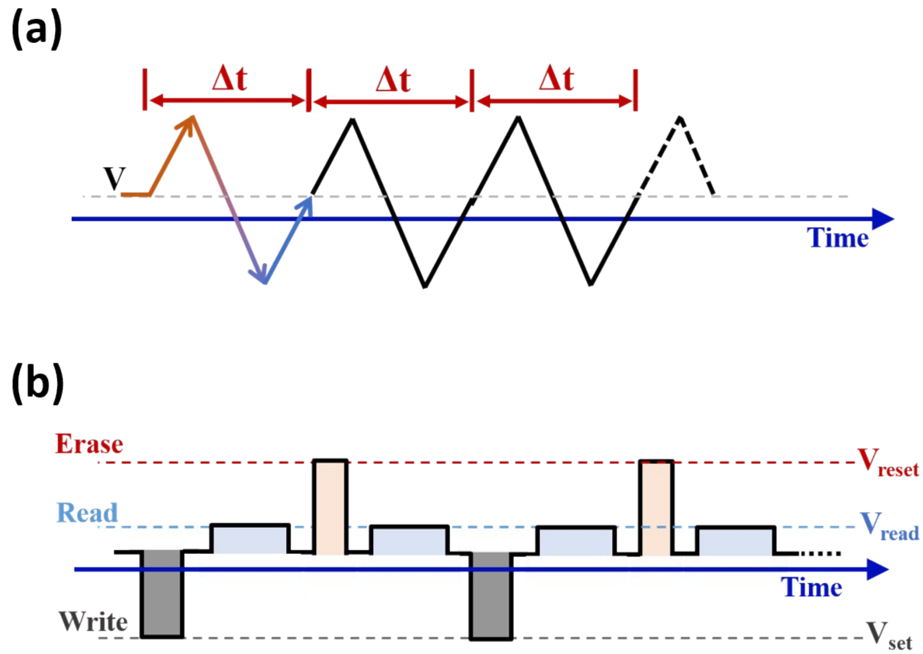

Fig. S1 | Voltage pulse train of electrical characterization on proposed $Ag/Sb_2Te_3/Ag$ memory. (a) Voltage pulse train of resistance switching hysteresis (0.2s per cycle). (b) Write, erase, and read pulse train for cycle endurance test on proposed $Ag/Sb_2Te_3/Ag$ memory, of which the voltage is set to V_{set}, V_{read}, and V_{reset}, respectively. The increment of 0.3s is set between each pulse.

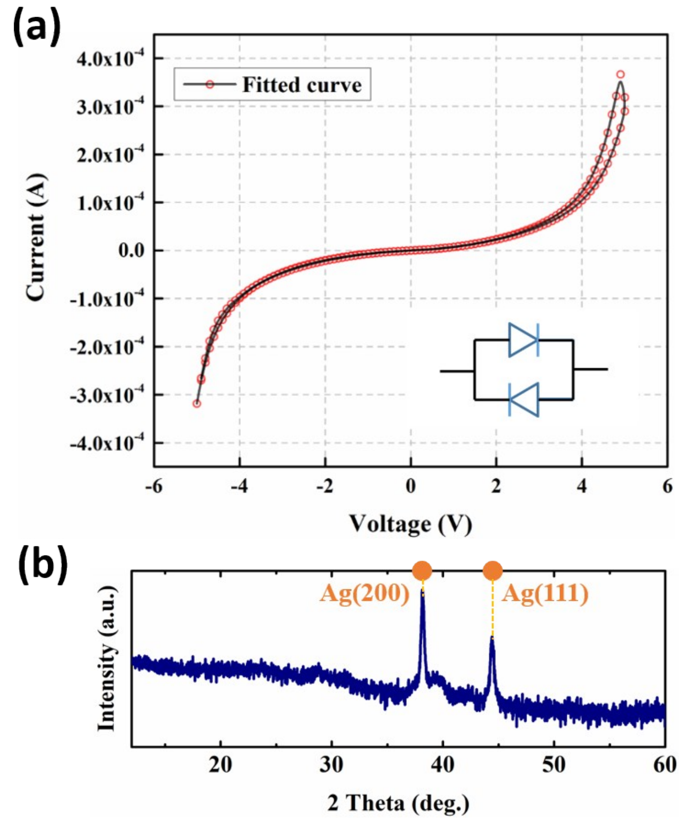

Fig. S2 | (a) I-V hysteresis on amorphous $Ag/Sb_2Te_3/Ag$ memory cell with sufficiently high voltage bias (|5.5 V|), maintaining reversible and smooth without current jump. (b) The X-ray diffraction with Ag (200) peak, indicating the amorphous state of Sb_2Te_3 in corresponding $Ag/Sb_2Te_3/Ag$ memory cell.

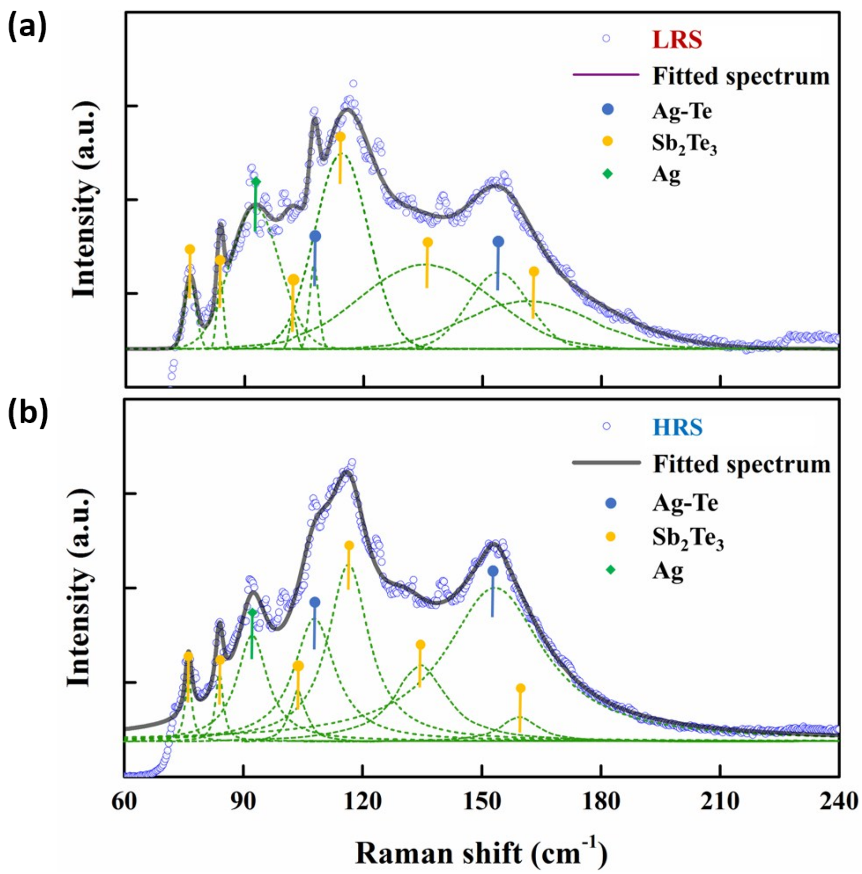

Fig. S3 | Original Raman spectrum of Ag/Sb_2Te_3/Ag hetero-cells under (a) LRS and (b) HRS, deconvolved with fitted Gaussian Raman peaks. Raman peaks that located at 102 cm^{-1}, 135 cm^{-1}, and 159 cm^{-1} are contributed by Sb-Sb and Te-Te bondings, which were not further studied in our investigations in order to simplify the research model.

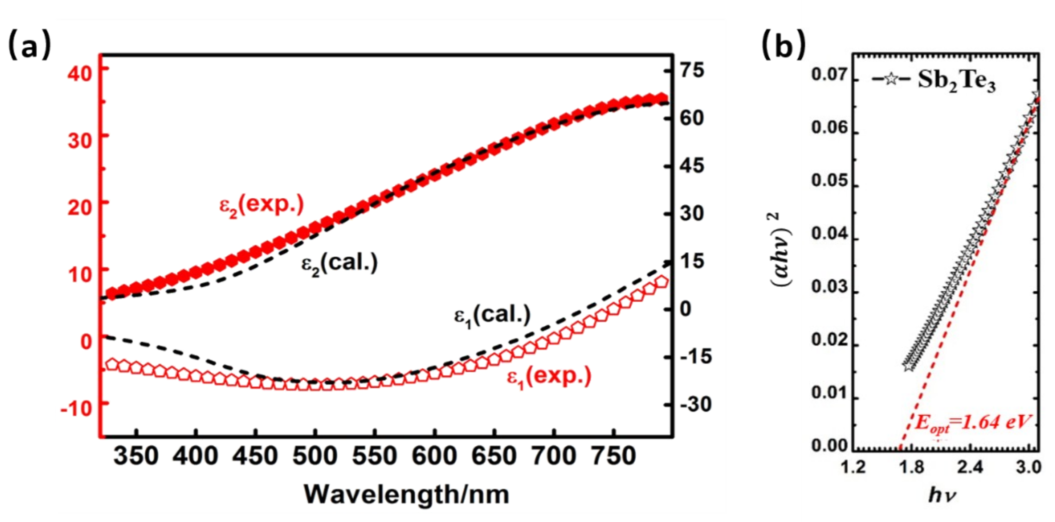

Fig. S4 | (a) Dielectric functions of crystalline Sb_2Te_3 are measured by spectroscopic ellipsometry and first principle calculation in the visible region from 320 nm to 790 nm. (b) The optical band gap of crystalline Sb_2Te_3 is 1.64 eV, determined by Tauc plot ($Eg{\sim}(\alpha hv)^2$) for direct band materials.

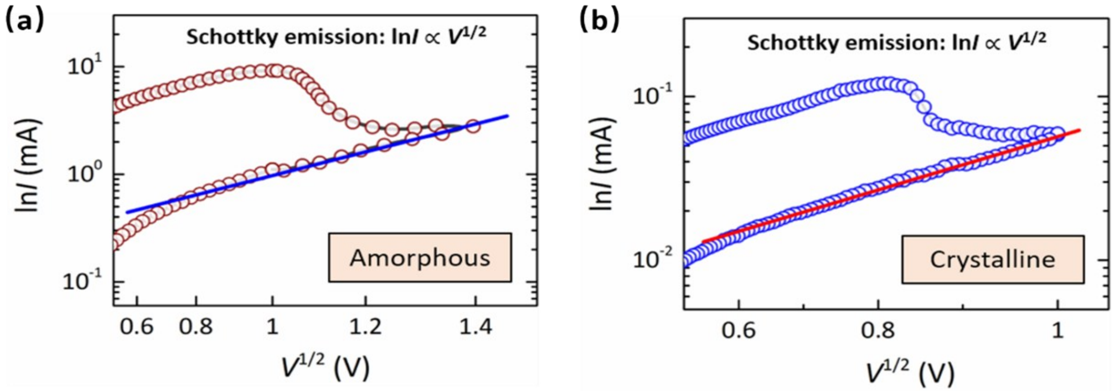

Fig. S5 | The I-V hysteresis of Ag/Sb_2Te_3/Ag memory cell under (a) amorphous phase and (b) crystalline phase can be transferred to $\ln\left(I/_{T^2}\right)-V^{\frac{1}{2}}$ curves to fit Schottky emission mechanism:

$$J = A * T^2 exp[-q\left(\phi_B - \sqrt{qE_i/_{4\pi\varepsilon_i}}/_{KT}\right)]$$