Supplementary Information (SI) for Nanoscale.

Highly Stable Two-dimensional Ruddlesden-Popper Perovskite Based Resistive Switching Memory Devices

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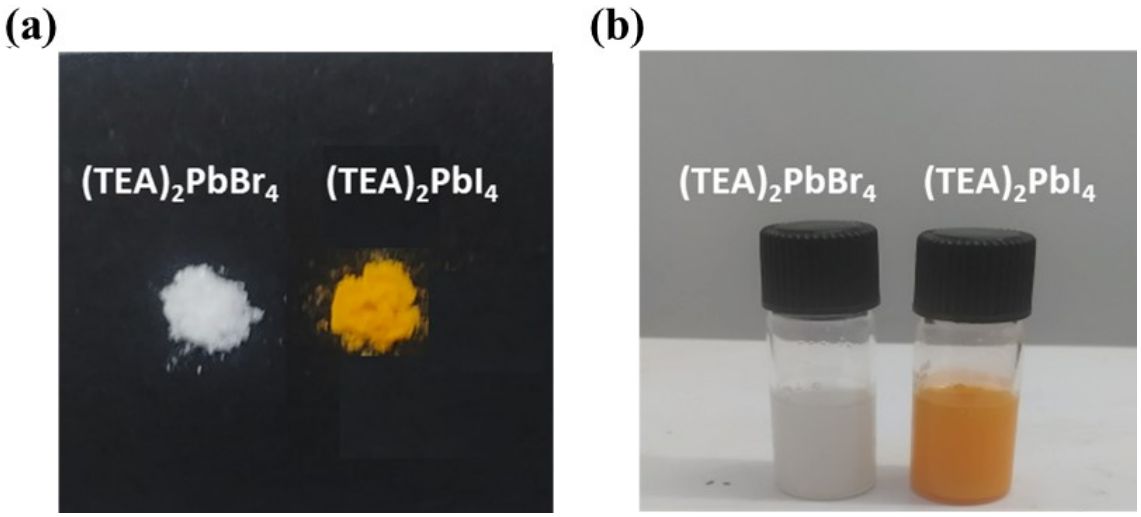

Figure S1. The photographs of $(TEA)_2PbBr_4$ and $(TEA)_2PbI_4$ perovskites (a) powder and (b) solution (in toluene). The photographs of uniform solutions of $(TEA)_2PbBr_4$ and $(TEA)_2PbI_4$ perovskites were taken after 5 minutes of shaking.

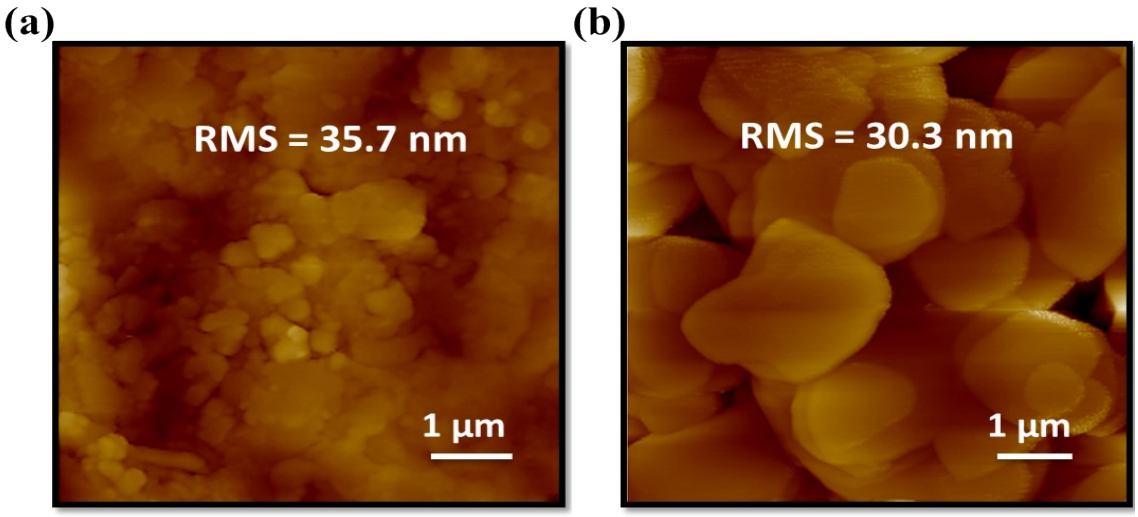

Figure S2. AFM images of (a) $(TEA)_2PbBr_4$ and (b) $(TEA)_2PbI_4$ perovskite films.

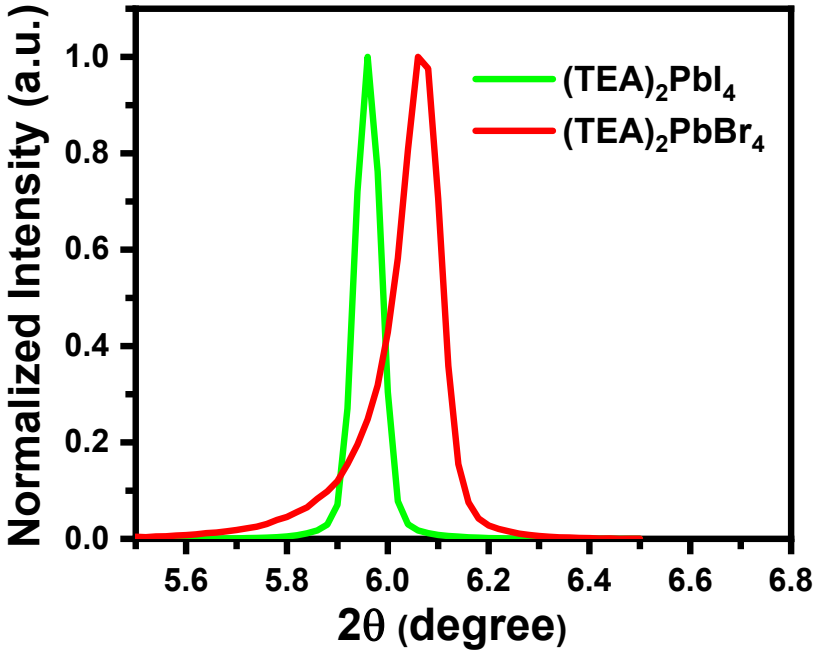

Figure S3. Enlarged view of low-angle diffraction peaks of $(TEA)_2PbBr_4$ and $(TEA)_2PbI_4$ perovskite films.

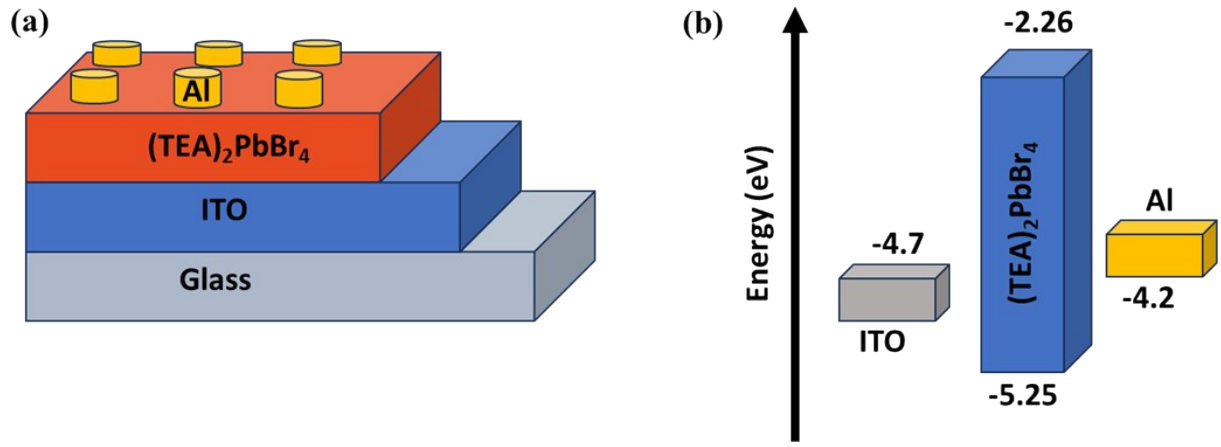

Figure S4. (a) Schematic illustration of $(TEA)_2PbBr_4$–based ReRAM device structure. (b) Visualization of energy levels of all components within the device.

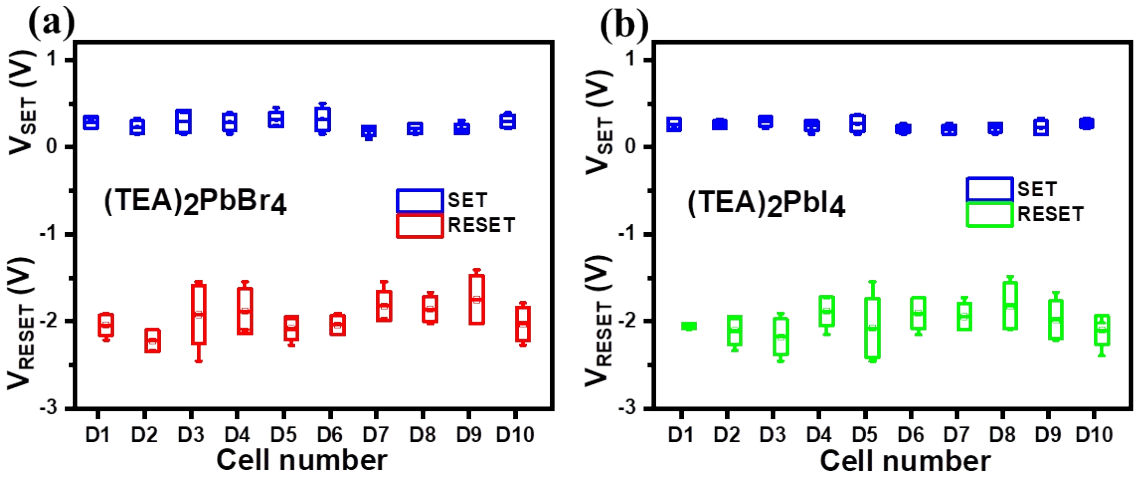

Figure S5. SET and RESET voltage distributions of 10 different cells fabricated using (a) $(TEA)_2PbBr_4$ and (b) $(TEA)_2PbI_4$ perovskites. DN (N= 1,….10) represents device number.

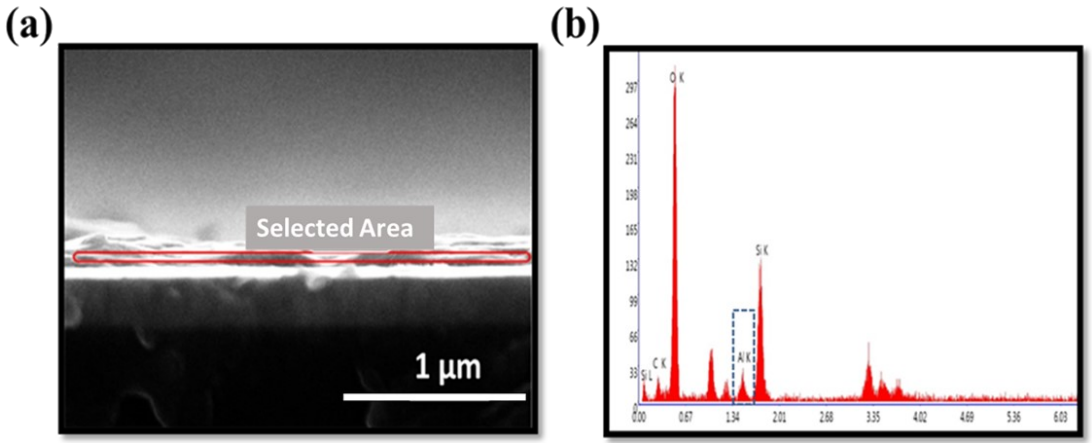

Figure S6. (a) The cross-sectional SEM image of $(TEA)_2PbI_4$-based ReRAM device. (b) EDS spectrum measeared in a specific cross-sectional perovskite area (indicated by a box) of the device. The spectrum of Al is shown by a dotted area.

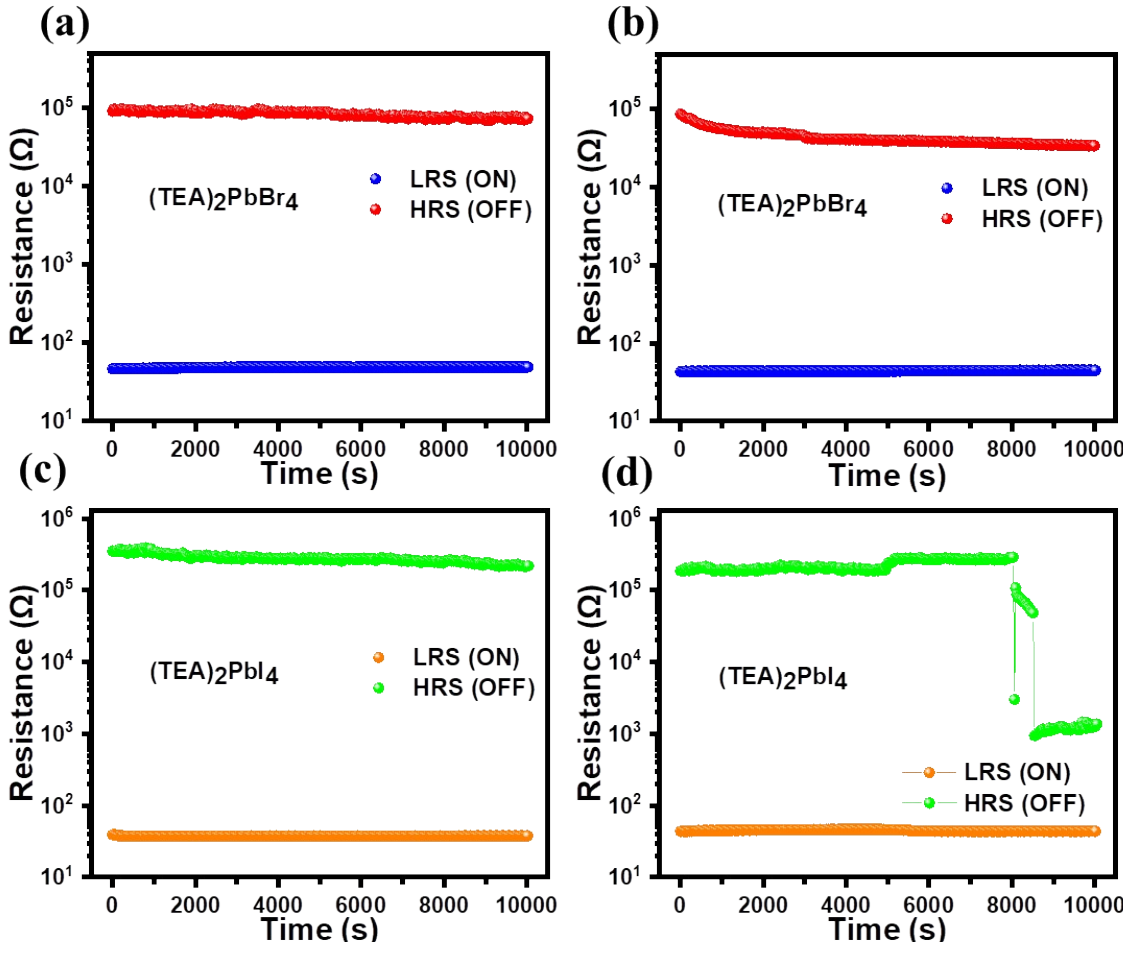

Figure S7. The retention properties of the ON and OFF states of $(TEA)_2PbBr_4$ PRM device measured on (a) 1st and (b) 45th day, and of $(TEA)_2PbI_4$ PRM cell measured on (c) 1st and (d) 45th day.