Photosensitive resistive switching in parylene-PbTe nanocomposite memristors for neuromorphic computing. Supplementary information

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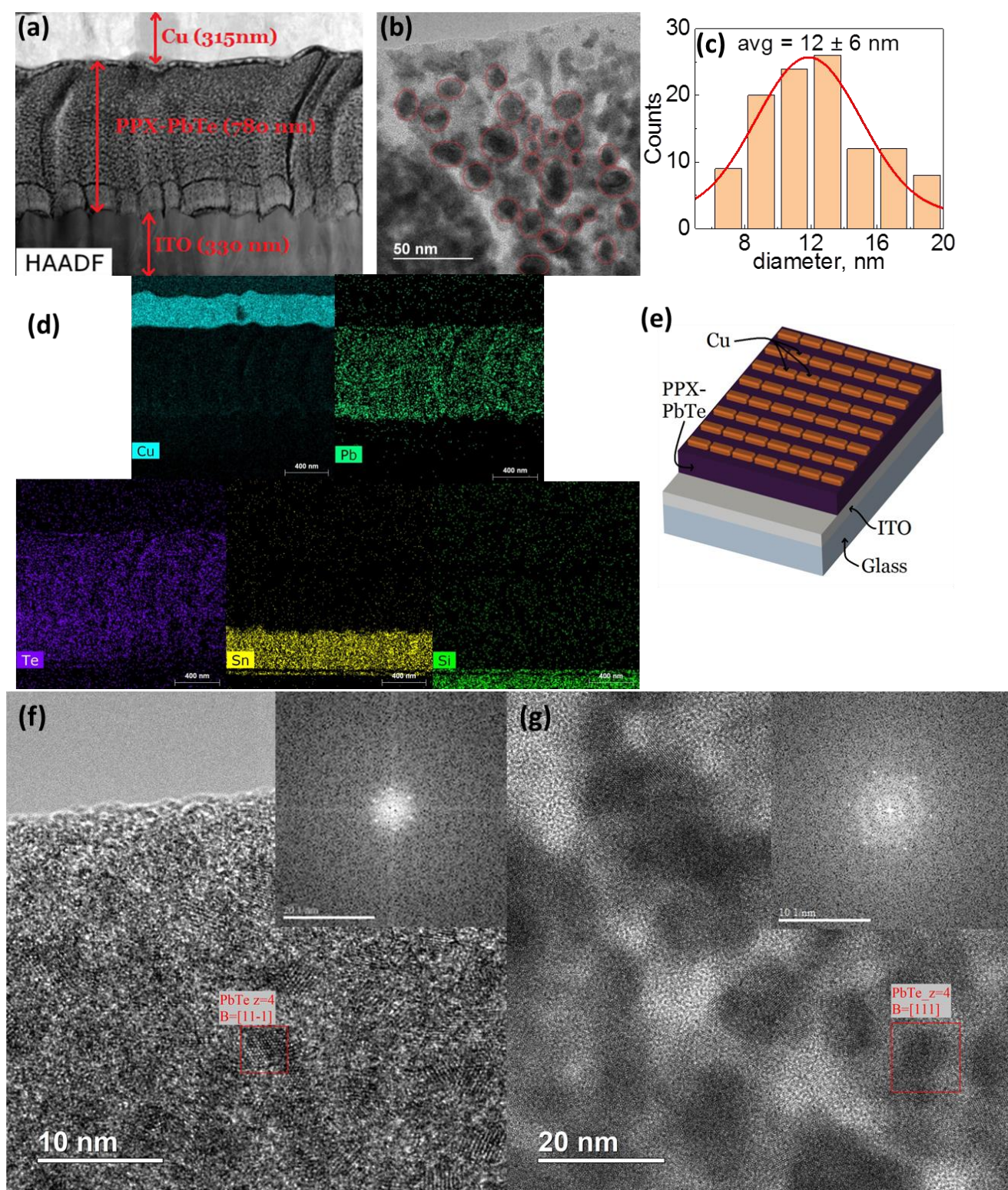[a] contributed equally.

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Fig. S1. Structural features of Cu/PPX-PbTe/ITO memristors with annealing. (a) Darkfield TEM cross-sectional image of annealed memristor. (b) High resolution TEM image. (c) Size distribution of PbTe nanoparticles from (b). (d) EDX maps of Cu, Pb, Te, Sn and Si elements. (e) Scheme of the Cu/PPX-PbTe/ITO memristive structure. HRTEM image of the structure before (f) and after (g) annealing. The insets show 2D FFT spectrum corresponding to the marked PbTe nanoparticles.
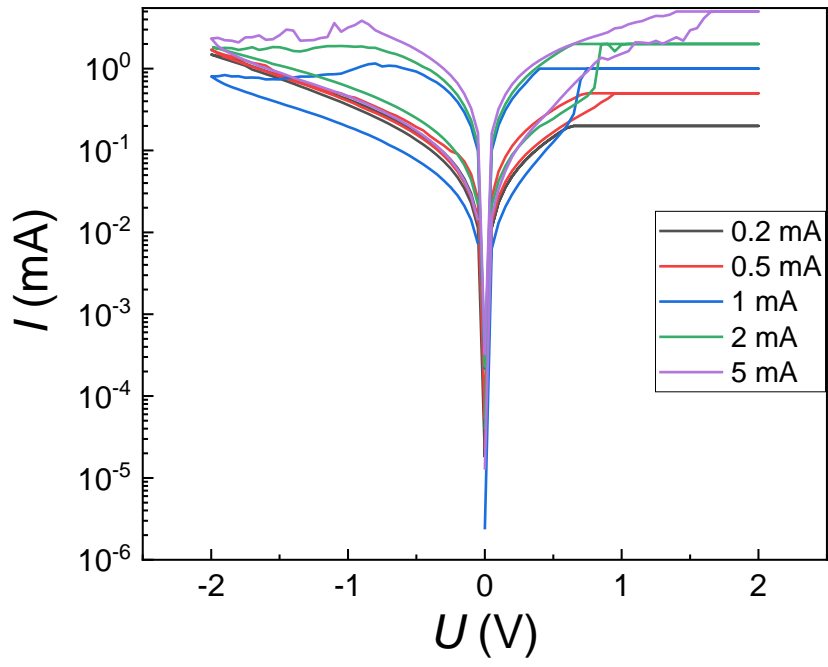
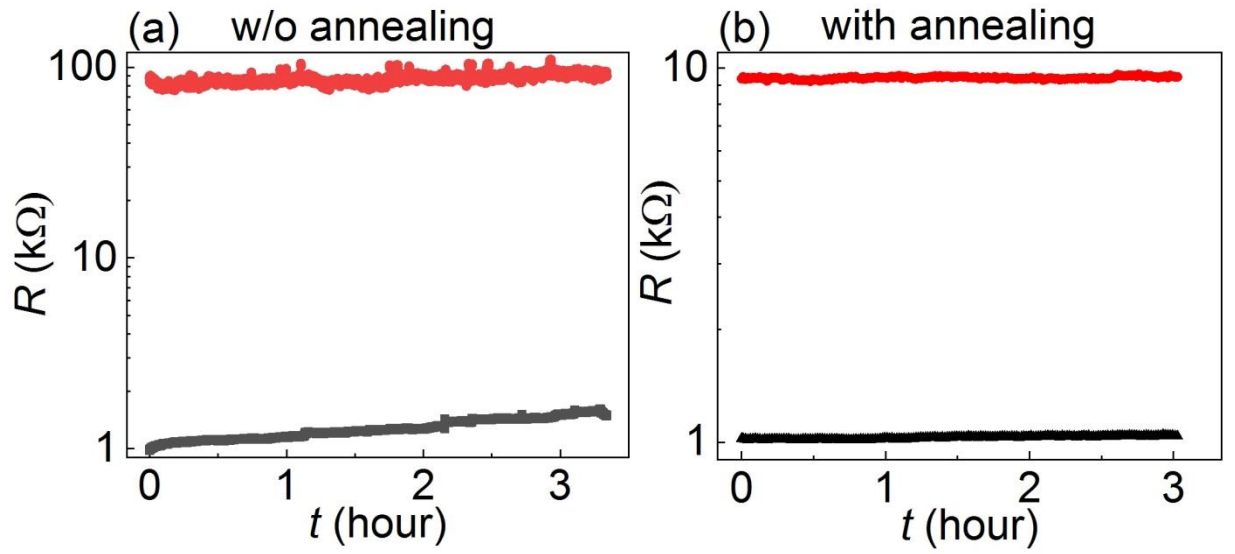Fig. S2. *I-V* cycles measured at different compliance currents (I_{cc}).

Fig. S3. Long retention time of two resistive states for the structures (a) without and (b) with annealing.
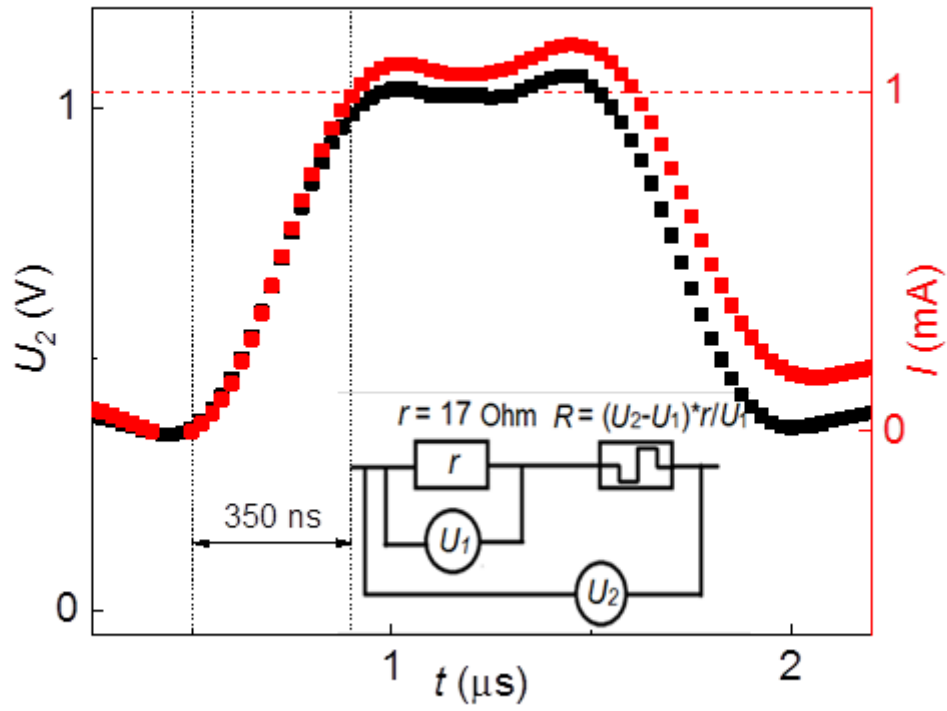
Fig. S4. Resistive switching time measurement: dependence of the pulse voltage and current through the memristor on time. The inset shows a measurement scheme with two channels of the oscilloscope. Initially memristor was in high resistance state. After applying a voltage pulse the current reached 1 mA level, which indicates that the structure was switched to low resistance state. Due to the long rise time of the voltage pulse (350 ns), it is not possible to derive the switching time directly. One can only estimate it as less than this time.
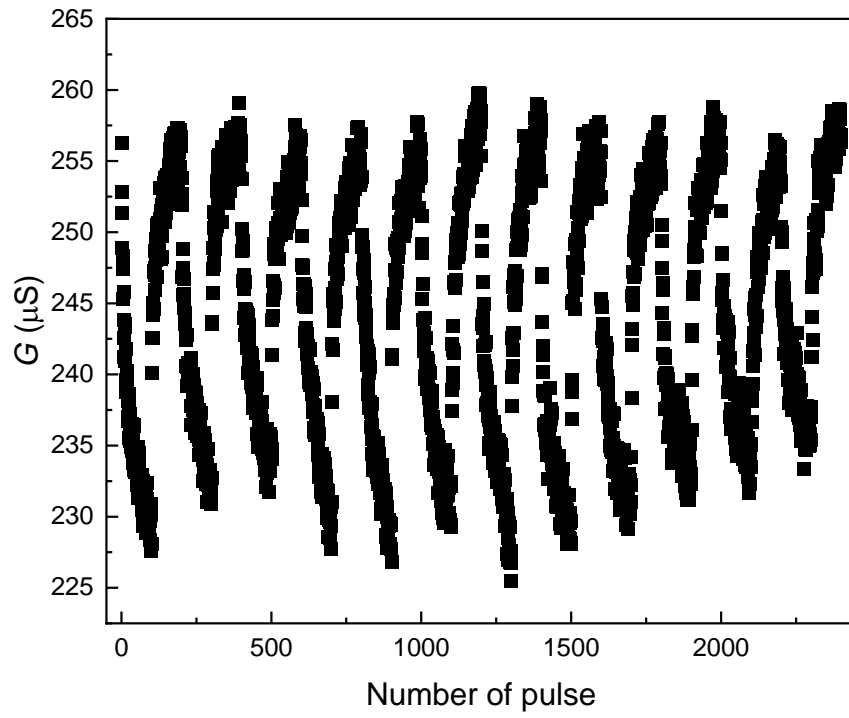
Fig. S5. LTD/LTP curves (12 sequences) obtained with 100 pulses with 1 ms duration and -0.4 V/0.5 V writing amplitude. After each writing pulse a reading pulse of 0.1 V amplitude and 1 ms duration was applied.
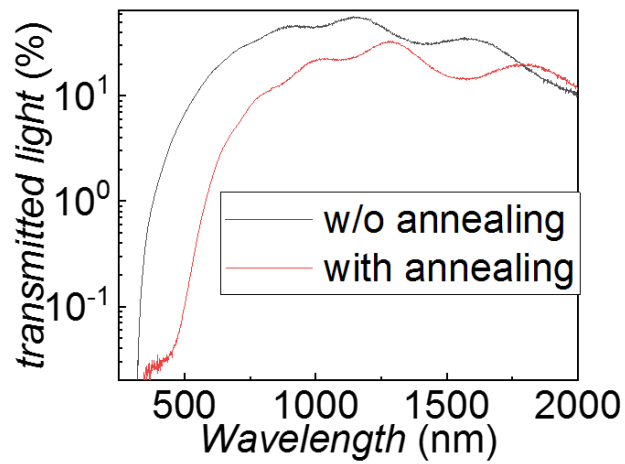

Figure S6. Transmission coefficient depending on wavelength of light for PPX-PbTe/ITO/glass structures with (red line) and without (black line) annealing.
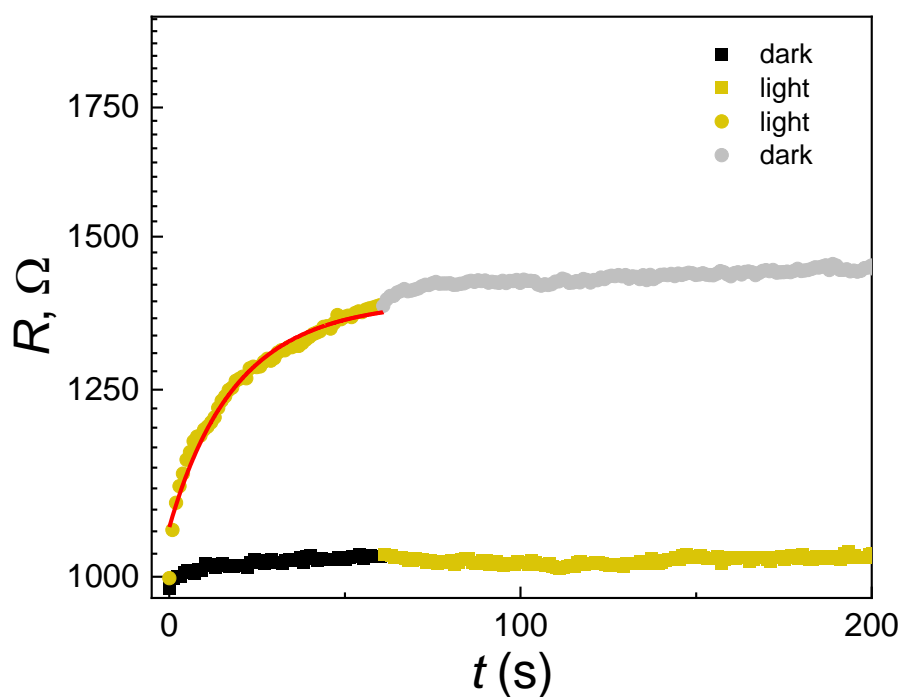
Fig. S7. Retention of the state programmed in dark: black squares represent retention in dark (first 60 s), yellow squares – retention with illumination (after 60 s). Retention of the state programmed with illumination: yellow dots represent retention with illumination (first 60 s), grey dots – retention in dark (after 60 s). Red line is the approximation by exponential function ($y = 1388 - 328e^{-\frac{t}{21}}$).