

Supplementary Information

Multilevel memristor effect in metal-semiconductor core-shell nanoparticles: tested by scanning tunneling spectroscopy

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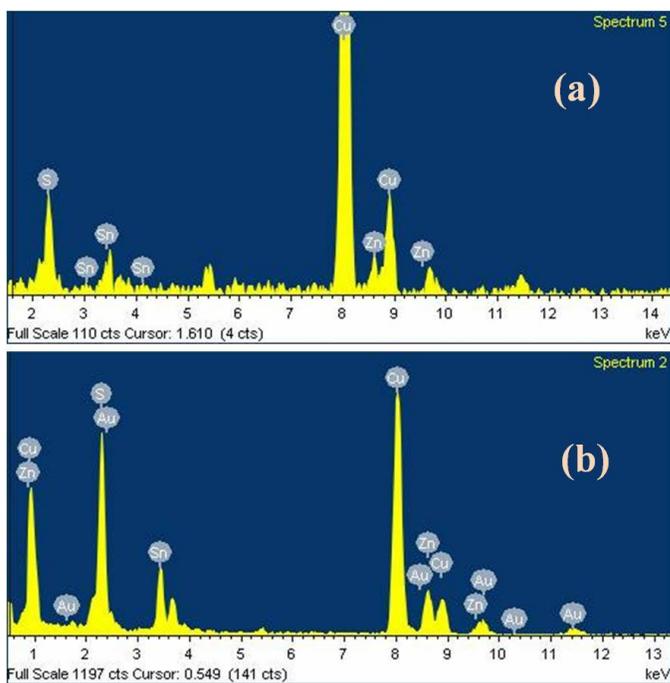


Fig. S1. EDX spectra of (a) CZTS nanocrystals and (b) Au-CZTS core-shell nanostructures.

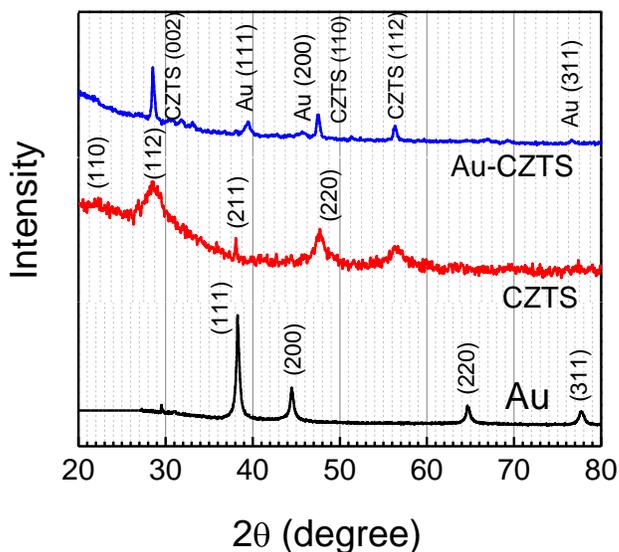


Fig. S2. XRD spectra of Au and CZTS nanocrystals and Au-CZTS core-shell nanostructures.

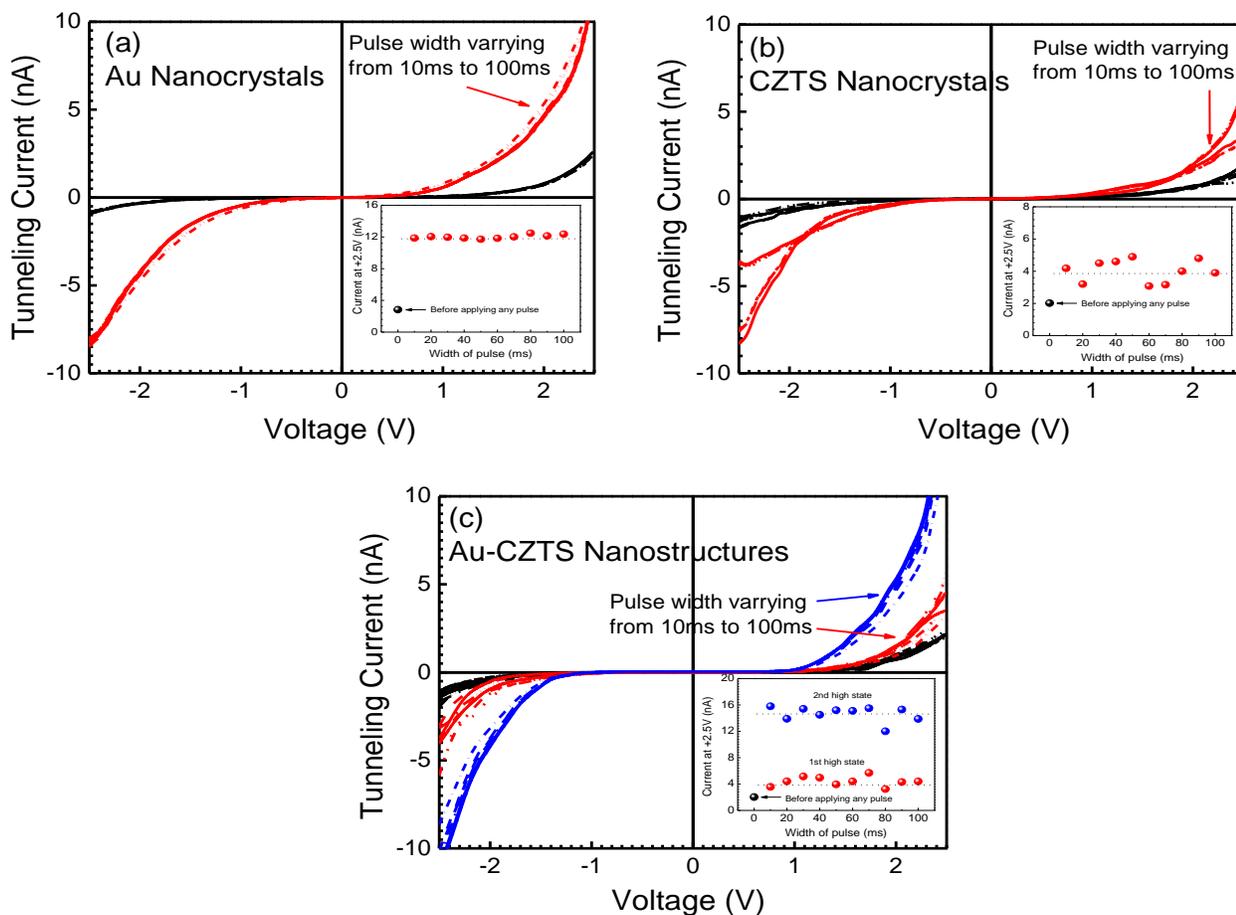


Fig. S3. Current-voltage characteristics of (a) gold, (b) CZTS nanocrystals and (c) Au-CZTS core-shell nanostructures after application of a voltage pulse of different pulse width (10-100 ms). A plot of current at +2.5 V as a function of the width of voltage pulse that preceded the measurement of tunneling current versus voltage characteristics is shown in the inset of each of the plots.

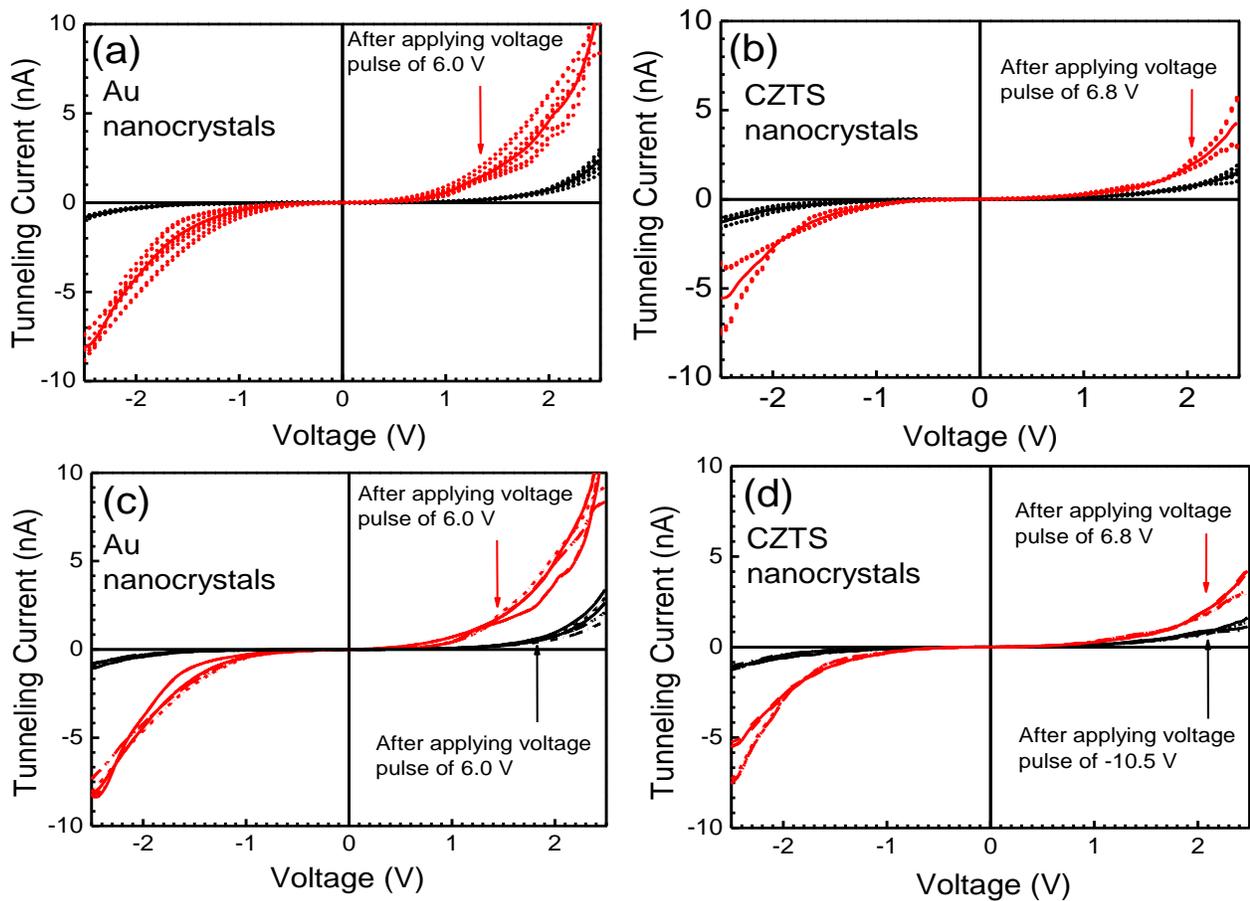


Fig. S4. Current-voltage characteristics of (a) Au and (b) CZTS nanocrystals before and after application of a positive voltage pulse (6.0 V and 6.8 V, respectively). Current-voltage characteristics of (a) Au and (b) CZTS nanocrystals after application of a positive (+6.0 and +6.8 V, respectively) and a negative voltage (-10.5 V) pulse in cycles.

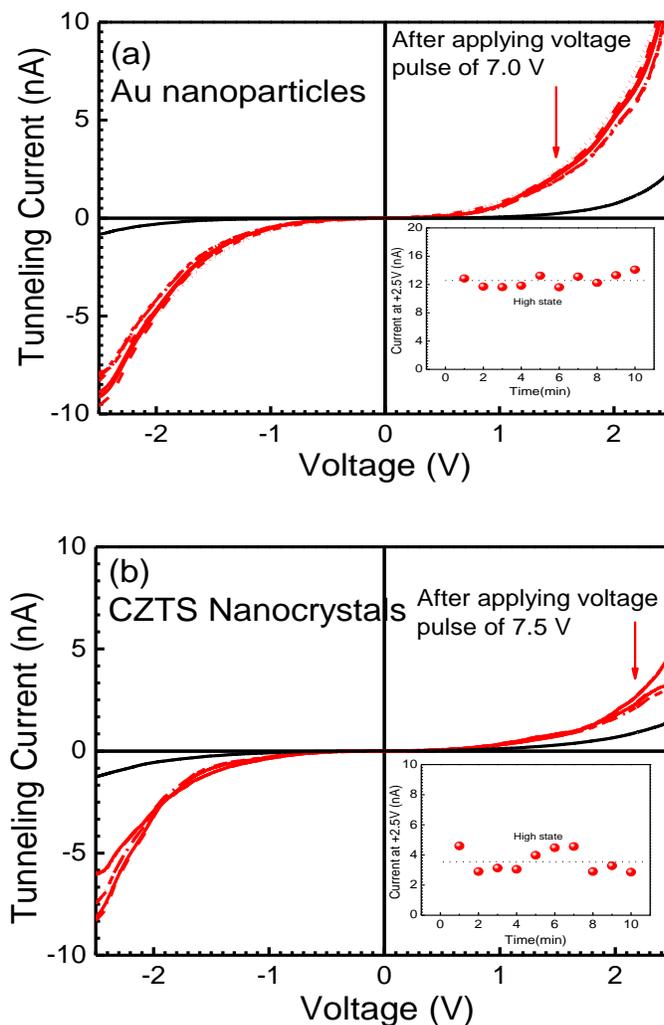


Fig. S5. Current-voltage characteristics of (a) Au and (b) CZTS core nanoparticles after application of a positive voltage pulse (+7.0 and +7.5 V, respectively). Characteristics were recorded for 10 times, after a minute each. *I-V* characteristics before application of the voltage pulse are also shown. A plot of current at +2.5 V (as obtained from the *I-V* characteristics) as a function of time is shown in the inset of the figures.