

ARTICLE

<https://doi.org/10.1038/s41467-020-14379-w>

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# Quasiparticle tunnel electroresistance in superconducting junctions

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The term tunnel electroresistance (TER) denotes a fast, non-volatile, reversible resistance switching triggered by voltage pulses in ferroelectric tunnel junctions. It is explained by subtle mechanisms connected to the voltage-induced reversal of the ferroelectric polarization. Here we demonstrate that effects functionally indistinguishable from the TER can be produced in a simpler junction scheme—a direct contact between a metal and an oxide—through a different mechanism: a reversible redox reaction that modifies the oxide's ground-state. This is shown in junctions based on a cuprate superconductor, whose ground-state is sensitive to the oxygen stoichiometry and can be tracked in *operando* via changes in the conductance spectra. Furthermore, we find that electrochemistry is the governing mechanism even if a ferroelectric is placed between the metal and the oxide. Finally, we extend the concept of electroresistance to the tunnelling of superconducting quasiparticles, for which the switching effects are much stronger than for normal electrons. Besides providing crucial understanding, our results provide a basis for non-volatile Josephson memory devices.

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# Superconducting Tunnel Junctions For Xray Detection

**M Walker**

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**X-ray and Ultraviolet Spectroscopy and Polarimetry** Silvano Fineschi, 1994 *Proceedings of an ESA Symposium on Photon Detectors for Space Instrumentation* T. D. Guyenne, J. J. Hunt, 1992 *JJAP*, 2003 INIS Atomindex, 1995 Selected Papers on Photon-counting Detectors Alan Smith, 1998 SPIE Milestones are collections of seminal papers from the world literature covering important discoveries and developments in optics and photonics *International Aerospace Abstracts*, 1999 *Chemical Abstracts*, 2002 **Development of High Resolution X-ray Spectrometers for the Investigation of Bioinorganic Chemistry in Metalloproteins** Owen Byron Drury, 2007 Low Temperature Physics and Chemistry, 1996 Superconductivity and Superconducting Materials Technologies P. Vincenzini, 1995 Summaries of Reports of the Electrotechnical Laboratory Denki Shikenjo (Japan), 1997

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