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Persistent electrical doping of Bi2Sr2CaCu2O8+x mesa structures HOLGER MOTZKAU, THORSTEN JACOBS, SVEN-OLOF KATTERWE, ANDREAS RYDH, VLADIMIR M. KRASNOV, Stockholm University, 106 91 Stockholm, Sweden — We study resistive switching phenomena in small $Bi_2Sr_2CaCu_2O_{8+x}$ (Bi-2212) mesa structures. Applying a significantly large bias voltage or short current pulses, we are able to controllably and reversibly manipulate the normal state resistance and doping state of the same single crystal from an underdoped to the overdoped state without changing its chemical composition. We employ this effect for an analysis of the doping dependence of the electronic spectra of Bi-2212 single crystals by means of intrinsic tunneling spectroscopy. It is observed that such a physical doping is affecting superconductivity in Bi-2212 similar to chemical doping by oxygen impurities: with overdoping the c-axis critical current rapidly increases, while the critical temperature, the superconducting gap and the pseudogap decrease, indicating the presence of the critical doping point. We distinguish two main mechanisms of persistent electric doping: (i) even in voltage contribution, attributed to a charge transfer effect, and (ii) odd in voltage contribution, attributed to reordering of oxygen impurities.

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