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Electrical Breakdown in a V2O3 device at the Insulator to Metal Transition S. GUÉNON, SIMING WANG, J.G. RAMÍREZ, IVAN K. SCHULLER, Department of Physics and Center for Advanced Nanoscience, University of California, San Diego, S. SCHARINGER, D. KOELLE, R. KLEINER, Physikalisches Institut and Center for Collective Quantum Phenomena, Universität Tübingen, Auf der Morgenstelle 14, D-72076 Tübingen, Germany — We have measured the electrical properties of a V2O3 thin film micro bridge at the insulator metal transition (IMT). Discontinuous jumps to lower voltages in the current voltage characteristic (IV) followed by an approximately constant voltage progression for high currents indicate an electrical breakdown of the device. In addition, the IV curves show hysteresis and a training effect, i.e. the subsequent IV loops are different from the first IV loop after thermal cycling. Low temperature scanning electron microscopy (LTSEM) reveals that the electrical breakdown over the whole device is caused by the formation of electro-thermal domains (ETDs), i.e. the current and temperature redistribution in the device. On the contrary, at the nanoscale, the electrical breakdown causes the IMT of individual domains. In a numerical model we considered these domains as a network of resistors and we were able to reproduce the electro-thermal breakdown as well as the hysteresis and the training effect in the IVs. This work was supported by AFOSR grant number FA9550-12-1-0381.

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