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Resistive switching in nanodevices H. RAEBIGER, Yokohama Nat'l Univ., Yokohama, Japan and Univ. Federal do ABC, Santo André, SP, Brazil, A. C. M. PADILHA, Univ. Federal do ABC, Santo André, SP, Brazil, A. R. ROCHA, Univ. Estadual Paulista, São Paulo, SP, Brazil, G. M. DALPIAN, Univ. Federal do ABC, Santo André, SP, Brazil — A nanoscale metal/insulator/metal sandwich structure device may exhibit multiple resistive states, and switching between these states can be controlled by bias voltage. However, the underlying physical mechanism is poorly understood. We present an electronic mechanism that explains multiple resistive states in such devices due to multiple solutions of Poisson's equation. These solutions describe spontaneously charged states characterized by different (convex and concave) 'band bendings'. For an insulator with mainly donor type defects, the low-resistivity state is characterized by a negatively charged insulator due to convex band bending, and the high-resistivity state by a positively charged insulator due to concave band bending; vice versa for insulators with mainly acceptor type defects. We show that the coexistence of such states, and switching between them is determined by defect/impurity abundance, device size, and basic material properties.

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