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Investigation on the Mechanism and Application of Nanoscale NiO Memristors ZHONG SUN, YONGGANG ZHAO, Tsinghua Univ, MIN HE, LIN GU, CHAO MA, KUIJUAN JIN, LINLIN WEI, JIANQI LI, IOP, CAS, NANNAN LUO, QINGHUA ZHANG, WENHUI DUAN, CEWEN NAN, Tsinghua Univ, DEPARTMENT OF PHYSICS TEAM, IOP, CAS COLLABORATION, SCHOOL OF MATERIALS SCIENCE AND ENGINEERING COLLABORATION — In contrast to the oxygen-vacancy-based model for the memristive n-type metal oxides, the coexistence of cation and anion vacancies had been suggested theoretically to be crucial to the bipolar memristive behavior of NiO. We have revealed the deterministic role of concentration surplus of cation vacancy over anion vacancy in bipolar memristive NiO, with C-AFM measuring the electrical properties, and STEM combined with EELS characterizing the ionic vacancies, giving an experimental support for the first time to the dual-defects-based model, which is of fundamental importance for the comprehensive understanding of memristor mechanisms. Furthermore, we have fabricated NiO nanodots with AAO templates, in which the intrinsically rectifying-resistive switching (IR-RS) has been observed. This is the first work studying the IR-RS in the scale of real devices, where the feasibility for selection device-free memory application has been demonstrated. The IR-RS in NiO nanodots has been ascribed exclusively to the built-in $p-n$ homojunction, differing from previous cases dominated by the interfacial Schottky barriers.

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