

Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Effects of crystallinity in resistance switching behavior of epitaxial NiO films S.R. LEE, Department of Materials Science and Engineering, Seoul National University, H.M. KIM, K. CHAR, Department of Physics and Astronomy, Seoul National University, H.W. PARK, D.H. KWON, M. KIM, Department of Materials Science and Engineering, Seoul National University, M.R. JO, Y.D. PARK, Department of Physics and Astronomy, Seoul National University, D.C. KIM, S. SEO, Samsung Advanced Institute of Technology, R. JUNG, Department of Electrophysics, Kwangwoon University — We fabricated epitaxial NiO films (epi-NiO) on (100) SrRuO₃ (SRO) films at room temperature (NiO-RT), 500 °C (NiO-500), and 700 °C (NiO-700). Crystallinity of epi-NiO was characterized by X-ray diffraction spectra, which indicates that NiO grown at a higher temperature shows a better crystallinity. I-V properties and associated resistance switching (RS) are investigated by using Pt and SRO as top and bottom electrodes; NiO-RT and NiO-500 exhibit bipolar RS, while the RS phenomenon is not observed in NiO-700. Temperature dependence of initial I- V curves shows that pristine Pt/NiO-500 and Pt/NiO-700 are in an insulating and a metallic state, respectively. The Pt/epi-NiO interfaces are further investigated by transmission electron microscopy and its results will be presented. Our experimental results suggest that crystallinity of epi-NiO is a key parameter for bistability of oxygen states at the Pt/epi-NiO interfaces, which results in distinctive I-V characteristics and associated RS behavior. The implication of our work on the microscopic origin of general switching behavior in NiO will be discussed.

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Date submitted: 19 Nov 2009

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