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Effect of cation substitution on the resistive switching behavior in epitaxial NiO H.M. KIM, S.R. LEE, J.H. BAK, M.L. JO, Y.D. PARK, K. CHAR, Seoul N. Univ. — The resistive switching behavior of NiO has been extensively investigated due to the nonvolatile ReRAM device applications. In contrast to unipolar resistive switching of NiO grown on Pt, bipolar resistive switching is observed in NiO grown on $SrRuO_3$ (SRO). The unipolar switching has been explained by the formation and rupture of filamentary conduction with the Joule heating, while the bipolar switching is still controversial. Our previous study with epitaxial (epi) NiO, prepared under various growth conditions and electrodes, suggested that the oxygen defects at the NiO/top electrode (TE) interface may be responsible for the bipolar switching and TE may compensate the oxygen defects. In order to understand the role of the defect states at the interface on the resistive switching, 1-nm-thick epi-AlO_x interlayer has been deposited on and under epi-NiO. The I-V characteristics have been investigated with an epi-$CaRuO_3$ (CRO) as TE, resulting in a clean interface with NiO. SRO/NiO/AlO_x/CRO shows poorer switching endurance in the less than 25% of measured cells. However, SRO/AlO_x/NiO/CRO exhibits bipolar switching in the most of measured cells with better endurance. This may imply the different oxygen defect states of each interface of NiO. As an effort to investigate the defect states in bulk and their effect on the unipolar switching, the I-V characteristics of Al substitution in epi-NiO will be presented.

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