TF-001

A study on the Nickel Oxide as the Resistance Memory Device

Kwang Nam Choi[1], Jun-Woo Park[2], Hosun Lee[2], Kwan Soo Chung[1]

[1]Dept. of Electronics Engineering, KyungHee University, [2]Dept. of Physics, KyungHee University

Nickel oxide (NiO) has recently been receiving a great deal of attentions as a material for the Resistance Random Access Memory (RRAM) as a substitutional device of the conventional Si memory devices. Therefore the characterization of NiO material properties is crucial for the progress of NiO-based RRAM. The DC bias analysis and ellipsometry measurements were applied to the NiO thin films to understand electrical, topological, and optical phenomena and the origin of bistable resistive switching. The crystallinity of a deposited NiO thin film was polycrystalline according to TEM, XRD patterns and AFM images. After the electric field was applied to NiO thin film, conducting filaments formed under and around the top Pt electrode. The three electronic states, such as forming, “on”, and “off” were monitored using current-voltage measurement. These NiO thin films deposited at 500~600℃, oxygen partial pressure of 5~7%, and deposition power of 200W have better switching characteristics. The endurance of NiO RRAM device is 10^6times of writing cycles and 10^{12} time s of reading cycles with sensing margin (R_{reset}/R_{set}) of 1 order of magnitude. The switching speed is also measured by programmed pulse cycle, thus this NiO RRAM has less than 10ns “set” speed and less than 5μs “reset” speed.

Reference

[1] M. J. Lee, Y. Park, S. E. Ahn, B. S. Kang, C. B. Lee, K. H. Kim, W. X. Xianyu, I. K. Yoo, J. H. Lee, S. J. Chung, Y. H. Kim, C. S. Lee, K. N. Choi, K. S. Chung, Journal or Applied Physics, **103**, 013706 (2008)

TF-002

Bipolar resistive switching behavior in Ti/MnOx/Pt structure for nonvolatile memory devices

Min Kyu Yang[1,2], Jae-Wan Park[1], Tae Kuk Ko[2] and Jeon-Kook Lee[1]*

[1]Thin Film Materials Research Center, Korea Institute of Science and Technology,
[2]Department of Electrical and Electronic Engineering, Yousei University

The electrical properties in Ti/MnOx/Pt-based resistance random access memory devices with stable and reproducible bipolar resistive switching behavior were studied. The dependencies of memory behavior on cell area, operating temperature indicate that the conduction mechanism in low-resistance states is due to electrons hopping through filament paths. From x-ray photoelectron spectroscopy measurements, we observe that nonlattice oxygen ions at the MnO_X surface. The generation and recovery of oxygen vacancies with nonlattice oxygen ions are considered to be the mechanism of resistance switching in oxide ReRAM. Ti top electrode as an oxygen reservoir can provide sufficient nonlattice oxygen ions to recover the oxygen vacancies during the reset process, which will maintain good switching endurance in the ReRAM devices with Ti top electrodes.