<< 수상강연 >>

Nonvolatile Memory and Photovoltaic Devices Using Nanoparticles

Eun Kyu Kim, Dong Uk Lee

Department of Physics and Research Institute for Natural Sciences, Hanyang University

Quantum-structures with nanoparticles have been attractive for various electronic and photonic devices [1,2]. In recent, nonvolatile memories such as nano-floating gate memory (NFGM) and resistance random access memory (ReRAM) have been studied using silicides, metals, and metal oxides nanoparticles [3,4]. In this study, we fabricated nonvolatile memories with silicides (WSi2, Ti2Si, V2Si) and metal-oxide (Cu2O, Fe2O3, ZnO, SnO2, In2O3 and etc.) nanoparticles embedded in polyimide matrix, and photovoltaic device also with SiC nanoparticles. The capacitance-voltageand current-voltage data showed a threshold voltage shift as a function of write/erase voltage, which implies the carrier charging and discharging into the metal-oxide nanoparticles. We have investigated also the electrical properties of ReRAM consisted with the nanoparticles embedded in ZnO, SiO2, polyimide layer on the monolayered graphene. We will discuss what the current bistability of the nanoparticle ReRAM with monolayered graphene, which occurred as a result of fully functional operation of the nonvolatile memory device. A photovoltaic device structure with nanoparticles was fabricated and its optical properties were also studied by photoluminescence and UV-Vis absorption measurements. We will discuss a feasibility of nanoparticles to application of nonvolatile memories and photovoltaic devices.

References

[1] EunKyu Kim, Jae-Hoon Kim, and Dong Uk Lee, "Non-Volatile Memory and Tunneling Devices with Metal Oxide Nanoparticles", Metal Oxide Nanostructures and Their Applications, edit. by A. Umar and Y.-B. Hahn, Volume 4, Chapter 9, (American Scientific Publisher, 2010. 3)
[2] S. P. Kim, D. U. Lee, and E. K. Kim, Curr. Appl. Phys. 10(3), S478-S480 (2010).
[3] D. U. Lee, E. K. Kim, W.-J.Cho, and Y.-H. Kim, Appl. Phys. A 102(4), 933-938 (2011).
[4] D. Kim, D. U. Lee, E. K. Kim, and W.-J Cho, Appl. Phys. Lett. 101(23), 233510 (2012).

Keywords: Nanoparticles, Nonvolatile memories, Photovoltaic devices