

Fabrication and Characterization of nano-floating gate memory with Au nano-particles

Min Seung Lee^{1,2}, Dong Uk Lee¹, Jae-Hoon Kim¹, Eun Kyu Kim^{1*}, Won Ju Cho² and Won Mok Kim³

¹Quantum-Function spinics Lab. and Department of Physics, Hanyang University, Seoul 133-791, Korea,

²Semiconductor Nano-Electron Device & Process Lab, Department of Electronic Materials Engineer, Kwangwoon University, Seoul 139-701, Korea, ³Thin Film Materials Research Center, Korea Institute of Science and Technology, Seoul 130-650, Korea

* E-mail : ek-kim@hanyang.ac.kr

The nano-floating gate memory (NFGM) is an attractive candidate for the next generation memory device, because NFGM is fast write time due to the large current densities in the direct tunneling regime of thin oxide, also long retention time and non-volatility are achievable at much smaller injection oxide thickness, and operation at smaller voltage and with lower power than other flash memory.⁽¹⁻²⁾

In this study, we fabricated the floating gate non-volatile memory device with Au nano-particles by using digital sputtering method. The NFGM devices with Au nano-particles were fabricated on the *p*-type UNIBOND SOI wafers with a 100 nm top Si layer and a 200 nm buried oxide layer. The thickness of tunneling oxide was 3 nm SiO₂ and 5 nm SiON by using thermal oxidation and sputtering method. The deposition of 0.5 ~ 1 nm thick Au thin film as metal nano-particles, 45 nm thick SiO₂ and SiON layer as a control oxide was followed by sequential sputtering. This NFGM devices were analyzed by measuring the electrical method which due to programming and erasing works perform by a gate bias stress repeatedly, also characterized of subthreshold, threshold voltage shift and retention time. Finally, the feasibility of Au nano-particle in nano-device application such as NFGM device will be discussed.

참고문헌

1. S. Tiwari, F. Rana, H. Hanafi, A. Harstein, E. Crabbé, and K. Chan, Appl. Phys. Lett. **68**, 1377 (1996).
2. D.-W Kim, T. Kim, and S. K. Banerjee, IEEE Trans. Electron Devices **50**, 1823 (2003).