http://dx.doi.org/10.18689/2638-2075.a3.002

3rd International
Nanotechnology Conference & Expo
May 7-9, 2018 Rome, Italy

Nitrogen-Doped Si-Based Volatile Threshold Switching Device with High Reliability and Low Power Operation

Jae-Hyeun Park* and **Hyun-Yong Yu**
School of Electrical Engineering, Korea University, South Korea

An atomic switch, conductive bridge random access memory (CBRAM), is an electro-ionic resistive switching device that formation/rupture of conduction channel with metal ions, such as Ag and Cu, determines the ON/OFF state. Atomic switches are promising future information processing device because of its simple structure, great integrability, low power operation, and selectivity of volatile/nonvolatile operation. Especially, volatile threshold switching atomic switches have gained significant attention in recent years. However, instability of volatile switching operation is pointed out as a crucial problem. In this study, we propose a highly stable Pt/SiO_xN_y/Ag volatile threshold switching device that operates at 0.2V with a high on/off ratio (~10^5). As a nitrogen doping concentration becomes higher, both forming voltage and threshold voltage tends to decrease, which is explained by increased nitrogen trap density. More to the point, the threshold voltage variation was found to be reduced. In sum, the effect of nitrogen doping in volatile threshold switching device can increase reliability of the devices with remaining those electrical characteristics compared to Pt/SiO_2/Ag device. This research proved the effect of nitrogen doping in volatile threshold switching device with simple method, and it is expected to be applicable to other oxide-based volatile threshold switching devices. Moreover, the proposed devices can be extended to atomic switch-based logic circuit for future information processing applications.

Biography:

Jae-hyeun Park received his B.S. degree in Electrical Engineering from Korea University, Seoul, South Korea, in 2017. He is currently pursuing his M.S. degree in School of Electrical Engineering from Korea University. His current research interests include future memory and neuromorphic system.