

CeO₂ を用いた抵抗変化型メモリーにおける

NiGe 下部電極に関する研究

Investigation of the NiGe bottom electrode in CeO₂ based ReRAM Devices

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【Introduction】 Resistive RAM (ReRAM), which is a strong candidate for the next generation of nonvolatile memory, still calls for new material technology because its problems in efficiency and reliability. Cerium oxide is promising for ReRAM application since it can be used as solid electrolyte having high dielectric constant and high ion conductivity [1]. In addition, cerium oxide is easy to react with NiGe, which modifies structure and concentration of vacancies in cerium oxide film. This work proposes a high On/Off ratio of CeO₂ based RRAM.

【Experiment】 The structure of the devices is schematically shown in Fig.1. Fabrication started from growing a SiO₂ layer on highly doped Si wafers by thermal oxidation, followed by formation of contact windows through SiO₂ layer. After that, a NiGe bottom electrode layer, a CeO₂ switching layer and a W bottom electrode layer were deposited in succession. Finally, Al was evaporated as a back contact followed by RTA in N₂ ambient for 30 s at 400 °C. Device with NiSi₂ as bottom electrode layer was also fabricated for comparison.

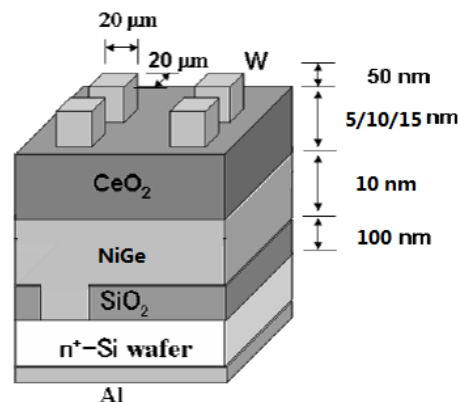


Fig.1. Schematic illustration of the RRAM device having W/CeO₂/NiGe structure

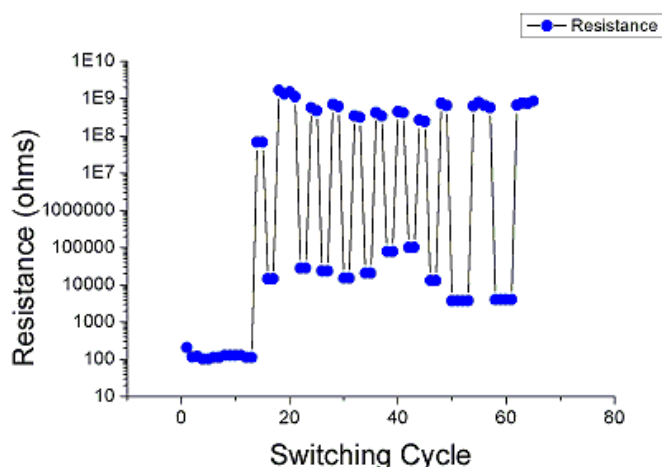


Fig.2 the Switching process of W/CeO₂ (5nm)/NiGe

【Result】 The initial state of this device is low resistance state and W/CeO₂ (5nm)/NiGe device shows the bipolar resistance switching behaviors. As shown in Fig.2, the ratio of high resistance state to low resistance state of this device takes an average value of about 10⁵. On/Off ratio about 10⁸ switching process was also observed.

[1] C. Lin, et al., Surface & Coating Technology 203, p.480-483, (2008)