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Effect of triple stacked bandgap-engineered tunneling barrier with silicon-rich-silicon-nitride layer as charge storage node in non-volatile memory applications

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$SiO_2/SiN_x/SiO_2$ (ONO) triple-stacked bandgap-engineered-tunneling-barrier (BETB) with silicon-rich-silicon-nitride (SRSN) for charge trapping layer were fabricated for non-volatile memory (NVM) applications. Charge trap floating gate NVM has been proposed as a hopeful candidate for the next generation NVM structure. Indeed, the scaling down for Charge trap floating gate NVM structure will suffer from the difficulty in adapting very thin tunneling oxide in order to the stress induced leakage current issue. Therefore, the employments of novel structures and new materials on NVM devices have been largely investigated against the limitations of the SiO2 based tunneling barrier in these days. Among those methods, BETB structure is one of the most promising techniques which attain low leakage current and high programming/erasing speed in NVM devices. In this work, we fabricated metal oxide semiconductor (MOS) structure with SRSN charge trapping layer using very thin multilayered BETB. I-V and C-V measurement were carried out by Agilent 4155C and 4284A respectably. According to their electrical properties that examined, the current characteristics of triple-stacked BETB structure depends on the thickness of SiO_2. The thinner the oxide thickness is, the better property is achieved. Moreover, it was investigated that the thickness over 4nm of SiN_x is not inconsequential on the charge trapping effect.