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Memory characteristics of MOS with doubly stacked silicon nanocrystals

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Doubly stacked Si nanocrystals in a metal-oxide-semiconductor (MOS) structure are investigated. The structures are created with up to two layers of size-controlled Si nanoclusters having a size of around 15 nm. In this work, a 7 nm thick SiO_2 film was thermally grown on *p*-type (100) silicon substrates (14～16 Ωcm) at 880℃ in dry oxidation furnace for the tunneling oxide layer, and then one or two layers of silicon nanoclusters were deposited by LPCVD at 640℃ with helium-diluted 5 % SiH_4 as a source gas. Furthermore, two layers of silicon nanoclusters were separated by a 10 nm thick SiO_2 using LPCVD at 400 ℃ with mixed gases of SiH_4 and O_2. The density of the silicon nanocluster whose size is 15 nm in average diameter was about 2.5×10^{11} #/cm^2. Then the control oxide was deposited 30 nm thick SiO_2 using LPCVD at 400℃ with mixed gases of SiH_4 and O_2. We fabricate a MOS structure with the doubly stacked Si nanocrystals in the gate oxide and investigate the C-V properties, which will be discussed.