

SIMULATION OF NON-VOLATILE MOS MEMORY USING Si QUANTUM DOT WITH Ge CORE AS ELECTRONICS STORAGE NODE

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ABSTRACT

The MOS memory using Si quantum dot with Ge core as a floating gate has been discussed and improved. The major concern of using Ge core cladding by Si nanocrystals is to enhance the carrier confinement effect since the energy gap of Ge is narrower than that of Si, a compound well could be formed in the center of the dot and the charge could be stored mainly in the side of Ge core. As the result, the retention time could be increase significantly without deteriorating the writing/erasing speed. The simulation shows that the flash memory with the dot size of 9-12nm in diameter possesses a retention time up to 10⁹ or about ten years with a 2nm-thick tunnel oxide, while the writing and erasing time is at the order of μ s which is similar to that of the memory based on pure Si quantum dot. Moreover, cladding Ge by Si nanocrystal allows us to keep the good Si-SiO₂ interface instead of poor Ge-Oxide interface.

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