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Characterization of charge trapping in Eu doped Al_2O_3 and its application to a nonvolatile memory. DONG HAK KIM, DAEYONG LIM, Department of applied physics, Kyung Hee University, Korea — Charge trapping and luminescence properties of Eu ions at different charge states have been investigated for Eu-doped-Al_2O_3/SiO_2/Si structure. X-ray photoelectron spectroscopy and photoluminescence spectra studies showed that doped Eu ions mainly exist in Eu^{3+} state for samples annealed at low temperature. When charges were injected by Fowler-Nordheim tunneling, Eu doped Al_2O_3 layer showed a strong electron trapping behavior. After high temperature thermal annealing in reducing ambient gas, the luminescence spectra changed into those of Eu^{2+}. However, charge trapping was negligible. Our experimental results indicate that Eu^{3+}ion in Al_2O_3 behaves as a strong electron trap while Eu^{2+}ion formed after high temperature thermal annealing behaves as a strong luminescent center. As an application, we fabricated a non-volatile memory MOS structure using Eu doped Al_2O_3 as a charge trapping layer and obtained good memory properties.

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