

Properties of Dy-doped La₂O₃ buffer layer for Fe-FETs with Metal/Ferroelectric/Insulator/Si structure

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Abstract : The Metal-ferroelectric-semiconductor (MFS) structure has superior advantages such as high density integration and non-destructive read-out operation. However, to obtain the desired electrical characteristics of an MFS structure is difficult because of interfacial reactions between ferroelectric thin film and Si substrate. As an alternative solution, the MFS structure with buffer insulating layer, i.e. metal-ferroelectric-insulator-semiconductor (MFIS), has been proposed to improve the interfacial properties. Insulators investigated as a buffer insulator in a MFIS structure, include Ta₂O₅, HfO₂, and ZrO₂ which are mainly high-k dielectrics. In this study, we prepared the Dy-doped La₂O₃ solution buffer layer as an insulator. To form a Dy-doped La₂O₃ buffer layer, the solution was spin-coated on p-type Si(100) wafer. The coated Dy-doped La₂O₃ films were annealed at various temperatures by rapid thermal annealing (RTA). To evaluate electrical properties, Au electrodes were thermally evaporated onto the surface of the samples. Finally, we observed the surface morphology and crystallization quality of the Dy-doped La₂O₃ on Si using atomic force microscopy (AFM) and x-ray diffractometer (XRD), respectively. To evaluate electrical properties, the capacitance-voltage (C-V) and current density-voltage (J-V) characteristics of Au/Dy-doped La₂O₃/Si structure were measured.

Key Words : MFIS, Dy-doped La₂O₃, insulator, ferroelectric