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Deposition and characterization of amorphous aluminum nitride thin films for a gate insulator

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Abstract

Thin films of aluminum nitride (AlN) fabricated by reactive deposition were characterized in order to examine the electrical insulation properties suitable for a gate insulator. For a series of AlN films deposited with a variation of the amount of Al flux at a fixed N flux, compositional and chemical analyses were performed using X-ray photoelectron spectroscopy (XPS) and elastic recoil detection analysis (ERDA). Combined with the result of current-voltage (*I-V*) measurement, it is found that the insulation properties are correlated with the compositional ratio between Al and N estimated by the ERDA measurement; a good electrical insulation with a minimal leak current of the order of 10^{-9} A/cm² at a high electric field 1 MV/cm is achieved in the film of nearly stoichiometric compositional ratio of Al/N, in which the dominance of the Al-N bonding state is confirmed in the XPS

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