Electrical characteristics of GaN-based metal-oxide-semiconductor (MOS) structures

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Gallium nitride (GaN) has attracted considerable interest in electronic devices for applications in high temperature environment with high power conditions. The large lattice mismatch and the large thermal expansion coefficient difference between the GaN film and sapphire substrate make it difficult to get film of high quality and suitable for the metal-oxide-semiconductor (MOS) devices. However, deposited films can be subjected to different fabrication processes to exhibit good electrical characteristics. In this paper, we report on the fabrication and characterization of planar MOS capacitor based on GaN grown on sapphire substrate. The effects of annealing treatment under vacuum and without vacuum and variation of annealing temperature were investigated. The roughness, morphology, composition and crystalline quality of the GaN film were determined by atomic force microscopy (AFM), energy dispersive x-ray analysis (EDX) and x-ray diffraction (XRD). The fabricated MOS structure was characterized using capacitance-voltage (C-V) measurement.

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