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Growth of Gallium Nitride (GaN) on Aluminium Nitride Surfaces Grown by Electron-Beam Evaporator

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In this work, we have successfully grown a GaN layer by electron beam (e-beam) evaporator on aluminium nitride (AlN) layers using sapphire substrate. The AlN layers were prepared by molecular beam epitaxy (MBE) 1) directly on sapphire and 2) on GaN/sapphire MOCVD template. After the e-beam evaporator growth, the GaN layer was annealed at a temperature of 950 °C in ammonia (NH_3) ambient as an attempt to improve the crystalline properties of the GaN layer. From x-ray diffraction (XRD) measurement, the diffractions of GaN were observed at ~33° and ~34° in all annealed samples, showing few directions of growth had been promoted. On the other hand, field emission scanning electron microscopy (FESEM) measurement, the surface morphology is better for the GaN grown on AlN with the template structure due to improved grains coalescence and larger grains size. As comparison, the GaN layer also was grown on $Al_xGa_{1-x}N$. Interestingly, the GaN layer is further improved with the use of the surface, as measured by XRD and FESEM measurements.