

**Growth characteristics of GaN on Si(111) using AlN buffer layer
(AlN 완충층을 이용한 Si(111)기판 위의 GaN 성장특성에 관한 연구)**

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Many investigations have been performed for epitaxial growth of GaN films on Si substrate due to its advantages such as low cost, large size, and the potential for the easy integration of GaN-based devices with Si-based. Buffer layer such as AlN or GaN is critical for obtaining high quality GaN films on Si(111) substrate, because of their large difference of lattice constants and thermal expansion coefficients between GaN and Si.

In this study, for the growth of GaN on Si(111) substrate, AlN layer was used as buffer layer. The effect of AlN buffer layer on crystal quality of GaN grown on si(111) substrate was investigated.

An AlN layer was grown by metalorganic chemical vapor deposition (MOCVD) at 1020 °C with trimethylaluminum (TMAI) and ammonia (NH₃) as source gases. The thickness of AlN layer was changed from 10nm to 50 nm. The surface roughness and thickness of AlN buffer layer were analyzed by Atomic force microscopy (AFM) and scanning electron microscopy (SEM). High resolution transmission electron microscopy (HRTEM) was employed to analyze the microstructure of AlN buffer layers.

GaN was grown on Si(111) substrate using AlN buffer layer by MOCVD at 1060°C in atmospheric pressure. The trimethylgallium (TMGa) and NH₃ were used as source gases. To explain the growth characteristics of epitaxial grown GaN films on Si(111) with the various AlN buffer layers, the interface of AlN/Si and GaN/AlN were studied by HRTEM.

In case of epitaxial AlN buffer layer, the lattice match between GaN and AlN on in-plane and out-of-plane orientation was achieved, resulting in the epitaxial growth of GaN layer.

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