

[I~25]

Study on Epitaxial Growth of Gallium Nitride  
by Ion-Beam-Assisted Evaporation

전 찬욱, 김 익현, 김 선효  
포항공과대학교 재료금속공학과

**Abstract**

The gallium nitride thin films were grown on  $0^\circ$  and  $4^\circ$  inclined Si(111) substrates by the process of ion beam assisted evaporation(IBAE). With low energy  $N_2^+$  ion beam irradiation, the perfectly stoichiometric nitride determined by Rutherford Backscattering Spectrometry was synthesized, and the epitaxial GaN film was obtained at the relatively low temperature of  $500^\circ\text{C}$ . The GaN films deposited on  $4^\circ$  inclined Si(111) substrates shows much better crystalline properties compared to that on  $0^\circ$  inclined Si(111) plane because of many stable nucleation sites. The direction of GaN(0002) is intended to be closer to that of Si(111) when a beam condition approaches to the optimum condition for epitaxial growth of GaN. The optimum flux and energy of  $N_2^+$  ion irradiation for the epitaxial growth was found to be 3.4 of arrival flux ratio of Ga and  $N_2^+$  ( $J_{N_2^+}/J_{Ga}$ ) and 50eV. A thin amorphous layer at the interface between GaN epi-layer and Si substrate was observed from high resolution transmission electron microscopy analysis. This amorphous layer might relax the large misfit strain between GaN and Si substrate in an early stage of growth. The band gap and refractive index of GaN film was 3.26eV and 2.43 respectively.