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The effects of two stages GaN growth with different V/III ratios during 3D-2D transition

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GaN-based materials are of great interest because of their potential applicability to produce optoelectronic devices such as high efficiency light emitting diodes (LEDs), laser diodes (LDs) and high-power and high-temperature electronic devices. Such high performance devices require state of the art growth technologies such as molecular beam epitaxy (MBE) and metalorganic chemical vapor deposition (MOCVD). Although, it is difficult to grow high quality GaN epilayers due to large lattice and thermal expansion mismatch between sapphire substrate and GaN epilayer, high efficiency blue light-emitting diodes (LEDs) were achieved. Even though, it was shown that nitride-based devices were less sensitive to dislocations compared to other conventional semiconductor devices, the dislocations, which act as nonradiative recombination centers or leakage pathways for vertical conduction, degrade device performances and causes lower lifetimes. For this reason, several groups studied the effect of growth parameters, to improve the structural quality of GaN epitaxial layer, such as growth temperature, layer thickness, growth rate and thermal annealing. Another important parameter for material growth that effects the structural quality is V/III ratio. It is commonly observed that the lowered V/III ratios attribute to 3D growth mode. In this study, as a continuation of the studies in literature, we studied the impact of different V/III ratios in the initial (1st) stage of the HT-GaN layer growth which was performed in two stages with different V/III ratios on structural and optical properties. As well as, the effect of different V/III ratios in the later (2nd) stage of the HT-GaN layer growth were investigated.

Biography

Ismail Altuntas is a PhD Student from Cumhuriyet University, Physics Department. He is the Researcher of Nanophotonics Research and Application Center and Department of Nanotechnology Engineering.

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