

Analysis of the Abnormal Voltage–Current Behaviors on Localized Carriers of InGaN/GaN Multiple Quantum well from Electron Blocking Layer

Giwoong Nam¹, Byunggu Kim², Youngbin Park², Soaram Kim¹,
Jin Soo Kim³, Jeong-Sik Son⁴, Jae-Young Leem^{1,2*}

¹Department of Nano Systems Engineering, Center for Nano Manufacturing, Inje University, Gimhae, Gyungnam 621-749, ²Department of Nano Engineering, Inje University, Gimhae, Gyungnam 621-749, ³Division of Advanced Materials Engineering, Chonbuk National University, Jeonbuk 561-756, ⁴Department of Visual Optics, Kyungwoon University, Gumi 730-850, Korea

The effect of an electron blocking layer (EBL) on V-I curves in GaN/InGaN multiple quantum well is investigated. For the first time, we found that curves were intersected at 3.012 V and analyzed the reason for intersection. The forward voltage in LEDs with an p-AlGaN EBL is larger than without p-AlGaN EBL at low injection current because the Mg doping efficiency for p-GaN layer was higher than that of p-AlGaN layer. However, the forward voltage in LEDs with an p-AlGaN EBL is smaller than without p-AlGaN EBL at high injection current because the carriers overflow from the active layer when injection current increases in LEDs without p-AlGaN EBL and in case of LED with p-AlGaN EBL, the carriers are blocked by EBL.

Keyword: GaN Electron blocking layer Electroluminescence