

Improved surface morphology and optical properties of InGaN/GaN multiple quantum well structures grown by MOCVD using different growth parameters

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In this paper we report direct comparison results of three sets of InGaN/GaN multiple quantum well (MQW) structures grown by metal-organic chemical vapor deposition (MOCVD) on sapphire, with different GaN barrier growth conditions. Room temperature photoluminescence (PL) and atomic force microscopy (AFM) were used to characterize representative samples from each set. The PL spectra excited from the epi surface show an InGaN narrow band edge (NBE) peak and a broad deep level (DL) peak associated with levels pinned near midgap. A correlation between the NBE/DL ratio and AFM results was established. By optimizing the GaN barrier growth conditions, the NBE/DL ratio increased with decreasing root-mean-square (RMS) roughness and bearing factors from the AFM scans, indicating superior material quality. The implications of these findings for device applications and design will be discussed.