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Polarization Properties of III-Nitride Blue and UV Light-Emitting Diodes KEVIN KNABE, JAGAT SHAKYA, KYOUNG KIM, ZHAOYANG FAN, JINGYU LIN, HONGXING JIANG, Kansas State University — Polarization resolved electroluminescence (EL) studies of III-nitride blue and ultraviolet (UV) light emitting diodes (LEDs) were performed. The LEDs were fabricated on nitride materials grown by metalorganic chemical vapor deposition (MOCVD) on sapphire substrates (0001). Transverse electric (TE) polarization dominates in the InGaN/GaN quantum well (QW) blue LEDs (λ = 458 nm), whereas transverse magnetic (TM) polarization is dominant in the AlInGaN QW UV LEDs (λ = 333 nm). For the case of edge emission in blue LEDs, a ratio ($r = I_{\perp}/I_{//}$) of about 1.8:1 was observed between the EL intensities with polarization (TE mode) and (TM mode), which corresponds to a degree of polarization $\sim$ 0.29. The UV LEDs exhibit a ratio $r$of about 1:2.3, corresponding to a degree of polarization $\sim$ -0.4. This is due to the fact that the degree of polarization of the band edge emission of the $Al_xIn_yGa_{1-x-y}N$ active layer changes with Al concentration. The low emission efficiency of nitride UV LEDs is partly related to this polarization property. Possible consequences and ways to enhance UV emitter performances related to this unique polarization property are discussed. Effects of photonic crystal incorporation on the polarization properties will also be discussed.

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