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MOCVD Growths of Linearly-Shaped Staggered InGaN Quantum Wells Light-Emitting Diodes HONGPING ZHAO, JING ZHANG, TAKAHIRO TOMA, GUANGYU LIU, JONATHAN POPLAWSKY, VOLKMAR DIEROLF, NELSON TANSU, Lehigh University — High-efficiency InGaN-based quantum wells (QWs) light-emitting diodes (LEDs) play an important role in solid state lighting. However, the existence of both spontaneous and piezoelectric polarization fields in III-Nitride semiconductors leads to severe charge separation in InGaN QWs, which significantly reduces the electron-hole wavefucntion overlap (Γ_{e_hh}) in InGaN QWs. In this work, the growths of linearly-shaped (LS) staggered InGaN QWs LEDs are investigated. The InGaN QWs with LS staggered In-content profile were grown by metalorganic chemical vapor deposition (MOCVD). The use of LS staggered In-contents in InGaN QWs results in improved electron-hole wavefunction overlap (Γ_{e_hh}), in comparison to that of conventional InGaN QW. The power dependent cathodoluminescence (CL) measurement shows 2.5-3.5 times enhancement of CL intensity for LS staggered InGaN QWs as compared to that of the conventional InGaN QWs. Theoretical calculations using self-consistent 6-band ***k.p*** method were performed for both LS staggered InGaN QWs and conventional InGaN QWs. The experimental measurements show good agreement with the theoretical simulation.

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