

Determination of temperature and flux variations during ultra-thin InGaN quantum well growth on a 2" wafer for GaN Green LED

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The origin of the inhomogeneous distribution of photoluminescence (PL) peak wavelength on a commercial 2" GaN wafer for green light emitting diode has been investigated by wide momentum transfer (Q) range x-ray diffraction (XRD) profile of InGaN/GaN multiple quantum wells. Near the GaN (0004) Bragg peak, wide-Q range XRD ($\Delta Q > 1.4 \text{ \AA}^{-1}$) was measured along the growth direction. Wide-Q XRD gives precise and direct information of ultra-thin InGaN quantum well structure. Based on the QW structural information, the variation of PL spectra can be explained by the combined effect of temperature gradient and slightly uneven flow of atomic sources during the QW growth. In narrow variations of indium composition and thickness of QW, an effective indium composition can be a good character to match structural data to PL spectra.