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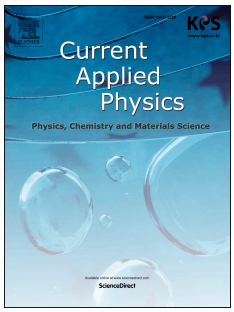

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Growth and Characterization of Single InGaN Quantum Well in Nonpolar *a*-plane $(11\bar{2}0)$ InGaN/GaN Light-Emitting Diodes

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We studied the In incorporation efficiency and composition distribution in a nonpolar *a*-plane InGaN (*a*-InGaN) quantum well (QW) layer. The In compositions decreased with increasing growth temperatures due to increased In desorption from InGaN surfaces. It was clear that the In incorporation efficiency on a nonpolar GaN surface is lower than that on a polar *c*-plane GaN. In addition, the In incorporation rate on an *a*-InGaN layer could be increased by decreasing the V/III ratio without lowering the growth temperature. In the case of the *a*-InGaN layer, a composition pulling effect was also observed, suggesting that the In composition of the *a*-InGaN layer increases along the normal growth direction from the bottom to the top of the InGaN QW layer. Using high-resolution XRD 2θ-ω scans, we found that there existed convex graded In compositions ranging from 4 to 12.7% in an *a*-InGaN QW layer along the growth direction. No wavelength shift with a current injection of 20 to 100 mA confirmed the absence of a polarization field. The shift in the electroluminescence (EL) peak energy was ~11 meV between the electric field parallel and perpendicular to the *c*-axis components, which was caused by the valence band splitting due to the in-plane compressive strain of the 10 nm *a*-InGaN QW layer. The EL polarization anisotropy was clearly observed with a polarization ratio of 55%.

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