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Light Emission Polarization Properties of a-plane InGaN/GaN Quantum Wells HUNG-HSUN HUANG, YUH-RENN WU, Graduate Institute of Photonics and Optoelectronics, National Taiwan University — This paper discusses the optical characteristics for nonpolar a-plane InGaN/GaN quantum wells (QWs) with different indium compositions, QW well widths, and injection carrier densities. We compared it with the results of the conventional c-plane QWs and analyzed the characteristics of optical anisotropy polarization in $(11\bar{2}0)$-oriented wurtzite a-plane InGaN-based QWs. A self-consistent Poisson, Schrodinger 6×6 k·p method is used to calculate the electronic band structure including the effect of strain on QWs. We found that different indium compositions, QW well widths, and injection carrier densities have significant influences to polarization ratio of light. We find that the larger indium composition and smaller well width make the energy separation of $|Y\rangle$-like state to $|Z\rangle$-like state larger, and as a result enhance the polarization ratio of light. However, the polarization ratio decreases as the carrier injection increases, which might be a drawback for high power applications. We have studied the optimization condition for designing the a-plane InGaN quantum well LED for applications, such as LCD back light modules and lasers, which would be useful information for device designs.

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