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EFFECTS OF V/III RATIO OF InGaN QUANTUM WELL ON THE PROPERTIES OF NEAR ULTRAVIOLET LIGHT EMITTING DIODES

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ABSTRACT- In this work, indium gallium nitride (InGaN) based near ultraviolet light emitting diode (NUV-LED) has been grown on a 2-inch *c*-plane patterned sapphire substrate at atmospheric pressure using metal organic chemical vapor deposition (MOCVD). The attention was paid to the effects of the V/III ratio of InGaN quantum wells (QWs) on the structural, optical, and electrical properties of NUV-LED. High resolution X-ray diffraction (HRXRD) results revealed that the indium composition and InGaN QWs' thickness was increased as the V/III ratio changes from 20871 to 11824. In addition, it was found that V/III ratio has a significant impact on the surface morphology of the InGaN QWs and hence the surface morphology of the subsequent layers. The surface roughness of the top p-GaN layer slightly changed and will further be discussed in this work. Apart from that, the electroluminescence results show that the light output power (LOP) and the emission peak wavelength of the NUV-LED were significantly affected by the V/III ratio. It is discovered that the LOP was increased up to 45% and the emission peak wavelength of the NUV-LED was shifted to red as the V/III ratio decreases from 20871 to 11824. Through this study, a correlation was found between V/III ratio and the properties of QWs that resulted in the LOP enhancement of the NUV-LED.

Keywords: MOCVD, HRXRD, InGaN, Light output power.