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Internal quantum efficiency improvement of InGaN/GaN multiple quantum well green light-emitting diodes

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Abstract:

In recent years, GaN-based light-emitting diode (LED) has been widely used in various applications, such as RGB lighting system, full-colour display and visible-light communication. However, the internal quantum efficiency (IQE) of green LEDs is significantly lower than that of other visible spectrum LED. This phenomenon is called “green gap”. This paper briefly describes the physical mechanism of the low IQE for InGaN/GaN multiple quantum well (MQW) green LED at first. The IQE of green LED is limited by the defects and the internal electric field in MQW. Subsequently, we discuss the recent progress in improving the IQE of green LED in detail. These strategies can be divided into two categories. Some of these methods were proposed to enhance crystal quality of InGaN/GaN MQW with high In composition and low density of defects by modifying the growth conditions. Other methods focused on increasing electron-hole wave function overlap by eliminating the polarization effect.