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Numerical Study on Efficiency Droop of Blue InGaN Light-emitting Diodes

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Abstract

Specific designs on the band structures near the active region are investigated numerically by using the APSYS simulation program with the purpose to surmount the efficiency droop in the InGaN blue LEDs. Systematic analyses included the energy band diagrams, radiative and SRH recombination rates, distribution of electrons and holes in the active region, and electron overflow. Simulation results show that, with appropriate designs, the efficiency droop may be effectively reduced due to the increase of hole injection efficiency, the enhancement of blocking capability for electrons, or the uniform carrier distribution of carriers in the active region.