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Growth and Characterization of III-Nitride LEDs on Vicinal Sapphire Substrates N. KHAN, J. LI, J. Y. LIN, AND H. X. JIANG, Department of Physics, Kansas State University, Manhattan, KS 66506-2601 — GaN and related III-N alloys have great potential applications in optoelectronic devices such as light emitting diodes (LEDs), laser diodes (LDs) and high power electronic devices such as transistors. For improved performance and greater versatility of these devices, it is essential to improve the quality of materials and devices. It has been reported that growth on vicinal or misaligned substrates compared to flat ones, lead to smoother and higher crystalline quality thin films. Improved brightness and quantum efficiency, and a reduction of the forward current at which maximum quantum efficiency occurs are among the improved optical properties resulting from the use of misaligned substrates and a thick base layer. We report on the characteristics of InGaN based blue/green LEDs grown by metal organic chemical vapor deposition (MOCVD) on specially fabricated dome shaped sapphire substrates. These dome shaped substrates provide varying degrees of off-cut within a single wafer. Surface morphologies, crystalline qualities and emission properties across the entire wafer surface have been mapped by various techniques, including optical and atomic force microscopy (AFM), x-ray diffraction and electroluminescence and photoluminescence spectroscopy. The results are compared with those of blue/green LEDs grown on conventional on-axis substrates.

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