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$m$-Plane GaN Growth on “Double Miscut” Bulk Substrates for Blue Laser Diode Applications LEAH KURITZKY, DANIEL MYERS, KATHRYN KELCHNER, SHUJI NAKAMURA, STEVE DENBAARS, CLAUDE WEISBUCH, JAMES SPECK, Univ of California - Santa Barbara — Although nearly 100% of today’s commercial GaN devices are grown on the $c$-plane, the non-polar $m$-plane is an alternative orientation that is free from polarization-induced electric fields, which separate carrier wavefunctions in $c$-plane InGaN quantum wells (QWs) and reduce radiative recombination rates compared to $m$-plane. Performance of $m$-plane blue laser diodes is currently limited by low In uptake and broad linewidth in the blue spectrum compared to $c$-plane. This work examines the impact of $m$-plane surface miscut on these performance aspects. The morphology was examined by atomic force microscopy for homoepitaxy on co-loaded substrates: on-axis, $-1^\circ$ $c$-miscut, $1^\circ$ $a$-miscut. All three films showed regions of diagonal $a+c$ step direction where pure $a$- or $c$-direction steps were expected. These $a+c$ regions also emitted longer wavelength in fluorescence and cathodoluminescence than other step directions. “Double miscut” substrates in the combined $a$- and $c$-directions take advantage of the observed stable $a+c$ step direction and redshift. Multi-QWs on double miscut substrates exhibited $<30$ nm linewidth in the blue spectrum and higher In uptake than ever achieved for standard miscut $m$-plane.

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