Optical properties of MOCVD selective area growth of GaN

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Texas Tech University — Selective area growth (SAG) is useful for overcoming mis-
match between non-native substrates and epitaxial materials. SAG of GaN is carried
out using metallorganic chemical vapor deposition with silicon dioxide as the mask
material with openings ranging from 500 nm to several microns. This talk addresses
optical properties of completed GaN pyramidal islands grown using SAG. SEM-
based cathodoluminescence (CL) is used to investigate the bandgap emission. The
optical properties at different positions on the pyramids are related to overgrowth
conditions which determine the luminescence properties. The apex region is almost
fully relaxed, while the pyramid base exhibits a red-shifted CL spectrum. This shift
is attributed to stress and impurity incorporation in the overgrown sidewall region.
The red shift observed in CL spectra on the pyramid sidewall region gradually in-
creases from apex to base, varying by ~40 meV, when they exceed the size of
the opening in the silicon dioxide mask. However, the pyramid has almost uniform
luminescence properties when overgrowth does not occur. The CL line width is nar-
rowest at the pyramid apex, suggesting a decrease in the dislocation density. The
authors acknowledge support from the National Science Foundation (ECS–0609416
and ECS–0304224) and the J. F Maddox Foundation.

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Date submitted: 27 Nov 2007  Electronic form version 1.4