A new attempt to Epitaxial lateral overgrowth of GaN

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The growth of high-quality GaN films on silicon and sapphire substrates is very attractive for low cost optoelectronic and electronic devices, such as light emitting diodes, laser-diodes, and high electron mobility transistors and so on. However, the large lattice and thermal mismatch between GaN and substrate materials generates a high dislocation density and cracks in the epitaxial layer. Therefore, many studies have focused on stress and defect management techniques to reduce the density of cracks and dislocations. Epitaxial lateral overgrowth (ELOG) based on selective area growth (SAG) is promising technique whose value has been demonstrated in fabrication of those devices. The structural quality and optical efficiency of GaN-based materials can be improved using both techniques taking advantage of the strain relaxation and reduced piezoelectric field at the sidewalls of selectively grown ridges. Both techniques were studied in many different ways and especially based on regions of a wafer covered by a dielectric material, such as SiO2 or SixNy. By dielectric coating and patterning the underlying epitaxial substrate, the growth proceeds selectively only on the exposed regions.