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Defect engineering in Si substrate for strain reduction at GaN/Si interface MUHAMMAD JAMIL, JAMES GRANDUSKY, FATEMEH SHAHEDIPOUR-SANDVIK, College of Nanoscale Science and Engineering, University at Albany-State University of New York — We report on a novel method that could potentially reduce the high dislocation density and cracks caused by lattice and thermal mismatch strain at the GaN/Si interface. In this method nitrogen ion implantation at an energy of 75 keV and various doses is employed to cause defects in the substrate allowing higher freedom for realignment of AlN nuclei at the interface. Although a great number of misfit dislocations are formed at the interface due to lattice mismatch, screw dislocations are mostly formed at the grain boundaries. We will report on optical and morphological measurements on over 50 GaN/Si samples, performed to elucidate the potential for this technique. Our preliminary results indicate high crack reduction of the GaN layer to crack distances of 120 μm in 2μm thick GaN layers for samples undergoing ion implantation and defect annealing scheme. Photoluminescence measurements at room temperature show an increase in bandedge to yellow luminescence ratio indicative of higher quality of the layers.

Fatemeh Shahedipour-Sandvik

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