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Surface studies of gallium nitride quantum dots grown using droplet epitaxy on bulk, native substrates CHRISTINA JONES, SUNYEOL JEON, RACHEL GOLDMAN, Univ of Michigan - Ann Arbor, YIZHAK YACOBY, Hebrew University, ROY CLARKE, Univ of Michigan - Ann Arbor — Gallium nitride (GaN) and its applications in light-emitting diodes play an integral part in efficient, solid-state lighting, as evidenced by its recognition in the 2014 Nobel prize in physics. In order to push this technology towards higher efficiency and reliability and lower cost, we must understand device growth on bulk GaN substrates, which have lower defect densities and strain than template GaN substrates grown on sapphire. In this work, we present our findings on the surface properties of GaN quantum dots (QDs) grown on commercial bulk GaN. QDs are grown using the droplet epitaxy method and analyzed using a surface X-ray diffraction technique called Coherent Bragg Rod Analysis (COBRA), which uses phase retrieval to reconstruct atomic positions near the substrate surface. While several QD growth conditions in our study produce dense QDs, COBRA reveals that only low nitridation temperatures result in GaN QDs that are coherent with the bulk GaN substrate. Results are supported with atomic force microscopy and high-resolution transmission electron microscopy.

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