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## Growth and characterization of homoepitaxial m-plane GaN on native bulk GaN substrates: Prospects of next-generation electronic devices

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Nonpolar (m-plane) nitride heterostructures-based electronic devices are, unlike their polar (c-plane) counterparts, devoid of spontaneous polarization and piezoelectric fields. This unique feature makes nonpolar nitride materials very promising candidates for normally-off enhancement mode transistors which are highly demanded in safe power switching operation and also for very stable light emitters owing to the suppression of the quantum confined Stark effect. Recent breakthroughs in the bulk GaN growth technology have made low defect m-plane GaN substrates commercially available, paving the way for higher-quality homoepitaxial GaN growth and the development of vertical devices. However, the growth of nominally on-axis homoepitaxial GaN layers by metal-organic vapor phase epitaxy (MOVPE) on these native substrates generates wavy surface reliefs characterized by three-dimensional four-sided pyramidal hillocks which are detrimental for device fabrication. In addition, a higher unintentional impurity incorporation in non-polar nitride films hinders device performance and reliability. In this talk, we present a technique to reduce the formation of pyramidal hillocks on the homoepitaxial m-GaN films. Smooth surfaces with very low density of hillocks are achieved under high V/III ratio and exclusively N<sub>2</sub> carrier gas. The electrical properties of m-GaN films were found to be dependent on the surface morphology. A clear improvement of the electrical properties can be observed by suppressing the hillocks. Subsequently, impurities concentrations in m-GaN films were significantly reduced with V/III optimization and pure N<sub>2</sub> carrier gas as confirmed by SIMS analysis. These results show good prospects for the development of next-generation electronic devices on non-polar GaN materials.

### Biography

Ousmane I Barry is pursuing his final year PhD at Nagoya University (NU) in Japan. He is also a Research Assistant at NU's Institute of Materials and Systems for Sustainability (IMaSS). His research interests lie in the epitaxial growth and characterization of III-nitride compound semiconductor materials for optoelectronic and high-power device applications.

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