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Cross-sectional scanning tunneling microscopy at GaN (10-10) HOLGER EISELE, LENA IVANOVA, Technische Univeristaet Berlin, SVETLANA BORISOVA, Forschungszentrum Juelich GmbH, MARIO DAEHNE, Technische Univeristaet Berlin, PHILIPP EBERT, Forschungszentrum Juelich GmbH — Group-III nitrides are the materials of choice for optoelectronic devices in the green to ultraviolet wavelength range. Recently, the question arose, whether the growth of GaN based devices could be improved by switching from polar surfaces to the non-polar ones. For non-polar GaN surfaces only little is known about the exact energetic positions of surface states, and thus their possible influence on the Fermi level. Furthermore, GaN still suffers from high dislocation densities, far above that of zincblende type III-V semiconductor crystals, which are detrimental for optoelectronic applications of GaN. Therefore we investigated the GaN(10-10) cleavage surface by cross-sectional scanning tunneling microscopy nd spectroscopy. We were able to identify the energetic positions of the intrinsic surface states and the Fermi level. We found that both, the filled N-derived and empty Ga-derived dangling bond states are outside the fundamental band gap, the latter one being 0.1–0.2 eV above the conduction band minimum. The observed band gap is 3.4±0.2 eV, in agreement with the nominal value from the bulk. The observed Fermi level pinning of about 1.0 eV below the conduction band edge is attributed to a high defect density at the surface, but not to intrinsic surface states.

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