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Effects of in-situ irradiation of nitrogen-hydrogen plasma on flatness and composition of GaN surfaces before epitaxial growth by a radical-enhanced metalorganic chemical vapor deposition HIROKI KONDO, AMALRAJ FRANK WILSON, DHASIYAN ARUN KUMAR, YI LU, NAOHIRO SHIMIZU, OSAMU ODA, KENJI ISHIKAWA, MASARU HORI, Nagoya University — Nitride semiconductors, such as GaN, AlN, InN and their composites, have attracted much attention for optical and electronic devices, due to their excellent properties such as wide bandgap energies. Recently, we have developed a radical-enhanced metalorganic chemical vapor deposition (REMOCVD) using a 100 MHz-excited plasma, and realized reduction of growth temperature of GaN without ammonia. Since native oxides are troublesome regardless of deposition methods, an in-situ cleaning to realize atomically-flat surface without any contaminant is strongly required. In this study, effects of in-situ plasma irradiation on GaN surfaces were investigated. N2/H2 plasma was irradiated to chemically-cleaned GaN surfaces. Flow rates of N2 and H2 were 750 and 250 sccm, respectively. The surfaces cleaned by the plasma with 400 W looked flat, and fine steak lines were found in their reflective high-energy electron diffraction (RHEED) patterns. They were kept even after ramp-up to 600C with plasma, although they became spotty without plasma which means nitrogen out-diffusion and formation of Ga droplets. Increase in plasma power also induced surface degradation. These indicated that the in-situ plasma irradiation is effective to obtain fine surface preferred epitaxial growth.

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