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Multilayer porous structures of HVPE and MOCVD grown GaN for photonic applications

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Abstract

In this paper we report on a comparative study of electrochemical processes for the preparation of multilayer porous structures in hydride vapor phase epitaxy (HVPE) and metal organic chemical vapor phase deposition (MOCVD) grown GaN. It was found that in HVPE-grown GaN, multilayer porous structures are obtained due to self-organization processes leading to a fine modulation of doping during the crystal growth. However, these processes are not totally under control. Multilayer porous structures with a controlled design have been produced by optimizing the technological process of electrochemical etching in MOCVD-grown samples, consisting of five pairs of thin layers with alternating-doping profiles. The samples have been characterized by SEM imaging, photoluminescence spectroscopy, and micro-reflectivity measurements, accompanied by transfer matrix analysis and simulations by a method developed for the calculation of optical reflection spectra. We demonstrate the applicability of the produced structures for the design of Bragg reflectors.