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The MOCVD overgrowth studies of III-Nitride on Bragg grating for distributed feedback lasers

Junze Li
Microsystem and Terahertz Research Center, China

Gallium nitride lasers, especially the single-mode distributed feedback (DFB) lasers using Bragg gratings own potential applications in communication systems due to their high-speed modulation. For the blue-violet light, the value of a period of the first-order diffraction grating is about 80 nm. This poses a big challenge when forming the high precision grating and nitride overgrowth based on it. We fabricated the fine step shape structure of first-order and 3rd order grating by nanoimprint and inductively coupled plasma (ICP) dry etching and we proceeded with an epitaxial regrowth of AlGaN layer with 6% to 12% Al content. Then we designed a series of gratings with different period, depths and duty ratios to study the influence of grating structure on nano-heteroepitaxy. And we improved the overgrowth by enhancing the growth temperature as high as 1450°C. Moreover, we observed the nucleation and growth process by step-by-step growth to study the growth mode for nitride overgrowth on grating, under the condition that the grating period was larger than the mental migration length on the surface. These samples were analyzed structurally by high-resolution transmission electron microscopy (HRTEM) and space-spectrally by cathodoluminescence (CL). The growth dynamics analysis of the nitride nano-epitaxial in this research is one of the frontier areas of nitride photoelectric devices, which is not only meaningful in semiconductor material physics, but also important for related scientific researches and applications.

Biography

Junze Li has completed his PhD from Peking University. He is working as the Research Assistant of Microsystem & Terahertz Research Center of China Academy of Engineering Physics (CAEP). He has published more than 20 papers in reputed journals.

lijunze@mtrc.ac.cn

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