LUMINESCENT DIAGNOSTICS OF LED HETEROSTRUCTURES BASED ON INGAN/GAN

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GaN-technologies are developing dynamically and are considered the most promising in the field of high-power optoelectronic devices. Requirements for optical, electrical and mechanical characteristics of the structures based on GaN, rise. At the same time the need for effective methods of research and diagnostics of the materials increases.

In this paper we studied the cathodoluminescence (CL) and photoluminescence (PL) characteristics of LED heterostructures based on InGaN/GaN grown under different technological conditions, with the aim of obtaining the experimental basis for the development of effective methods of heterostructures diagnostics.

As the samples were used blue LED heterostructures based on GaN grown by metalorganic vapor-phase epitaxy on sapphire. The active region of the samples consisted of multiple InGaN quantum wells and GaN barriers.

CL of heterostructures was excited by high-current electron beam (pulse duration 15 ns, energy density 0.05–0.5 J/cm^2). PL was excited by two sources: a nitrogen laser (λ = 337.1 nm, pulse duration 10 ns, the level of optical excitation ~10 kW/cm^2) and Xe lamp (pulse width 2 μs, equivalent power 75 kW).

In the luminescence spectra of the samples in addition to the main blue band of quantum wells InGaN/GaN we registered a number of emission bands in UV, green, yellow and red ranges. Dependences of the luminescence spectral composition on the source and the level of excitation were detected. The observed features of radiative recombination in LED heterostructures can be a basis for the creation of diagnostic methods of these materials.

Keywords: *luminescent diagnostics, LED heterostructures, InGaN/GaN, high-current electron beam, cathodoluminescence, photoluminescence.*