

Electrical and Luminescence Properties of Ultraviolet LEDs 365 – 400 nm

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Unlike ordinary LEDs of the visible radiation, ultraviolet (UV) InGaN/AlGaIn/GaN LEDs at wavelength λ from 365 to 400 nm have a wide range of applications: in industry, medicine, biology, science, etc., and are replacing the UV sources – lamps. The main problem of UV LEDs 365 – 400 nm are decrease the intensity of radiation and operation time at the transition to the shorter- wavelength area – from 400 to 365 nm. Also are undesirable tunneling effects and yellow electroluminescence (EL) from defects [1].

The industrial InGaN/AlGaIn/GaN UV LEDs on the Al₂O₃ and Si substrate are investigated. Nominal current $I = 350..500$ mA, electric power $P_{el} = 1..2$ W, area of structure $1143 \times 1143 \mu\text{m}^2$. The change of λ is achieved by changing the Indium content in the In_xGa_{1-x}N quantum well.

It is established that with increase the quantum well bandgap of UV LED (λ from 400 to 365 nm), the relative and absolute contribution of the parasitic visible (yellow) EL and the current of non-radiation recombination increases.

The analysis of the Capacitance-Voltage characteristics of UV LEDs 365, 375, 385, 390, 395, and 400 nm showed that the active area of such industrial LEDs contains one quantum well. The relationship between the Capacitance-Voltage and the EL intensity of UV band was not detected, capacitance has a significant spread.

Current-voltage characteristic with negative differential resistance region of UV LEDs was observed at liquid nitrogen temperature. The S-shaped curves were obtained due to the transition from single injection (electrons) to double (electrons and holes) injection.

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1. V.P. Veleschuk, A.I. Vlasenko, Z.K. Vlasenko, D.N. Khmil' etc. Visible Luminescence of the InGaIn/GaN Ultraviolet Light-emitting Diodes 365 nm // Journal of Nano- and Electronic Physics (2017) **9**, № 5, 05031(5). DOI: 10.21272/jnep.9(5).05031.