

DEGRADATION-RELAXATION PROCESSES
STIMULATED BY STRUCTURAL DEFECTS
IN GREEN GALLIUM-PHOSPHIDE
LIGHT-EMITTING DIODES

*O.V. Konoreva, P.G. Litovchenko, V.Ya. Opylat,
M.B. Pinkovska, V.P. Tartachnyk*

Institute for Nuclear Research,
Nat. Acad. Sci. of Ukraine
(47, Nauky Ave., Kyiv 03680, Ukraine;
e-mail: myrglory@yahoo.com)

S u m m a r y

The structural defects in green GaP light-emitting diodes (LEDs), initial and irradiated by gamma-rays, were studied using optical and electrophysical methods. The researches of the temporal variation of the electroluminescence intensity showed that the emergence of long-term relaxation processes can be caused by intrinsic dislocation grids — large-scale structural defects — namely, dark-line and dark-spot defects (DLDs and DSDs, respectively). Irradiation does not generate additional relaxation centers but only assists in revealing those already available in the crystal. The fine structure of the current-voltage characteristics (CVCs) in the negative differential resistance (NDR) region, which has been found in the low temperature interval $T = 77 \div 110$ K, evidences for the availability of a considerable number of deep recombination levels in the depletion region of the GaP $p-n$ junction. The character of current oscillations is governed by the alternating depletion and population of those levels. Irradiation of LEDs by Co^{60} γ -rays extends CVC intervals, where oscillations are observed; similar changes of CVCs are caused by the ultrasound treatment. Such a response of the green GaP LEDs results from the concentration increase of deep recombination levels.