

# Analysis of dose-dependent luminescence of uncapped InGaAs quantum dots under $^{60}\text{Co}$ $\gamma$ -rays treatment

Friday 7 November 2025 11:45 (5 minutes)

We studied the influence of  $\gamma$ -irradiation on light-emitting characteristics (including intensity, peak position and half-width of photoluminescence bands) of the arrays of capped  $\text{In}_x\text{Ga}_{1-x}\text{As}/\text{GaAs}$  QDs ( $x = 0.4$ ) grown on **GaAs** (100) substrates. To reveal the radiation resistance of QDs we analyzed the dose-dependent variation of photoluminescence spectra after the treatment with  $\gamma$ -rays of  $^{60}\text{Co}$  source (doses varied in the range  $1\div 10^3$  kGy range). Photoluminescence was excited using solid state laser with  $h\nu = 2.33$  eV. Temperature dependences of photoluminescence spectra were registered in the temperature range 5 - 200 K.

It is shown that light emitting properties of the samples under study do not decline in the dose range up to  $10^3$  kGy, on the contrary, they even become better: the intensity of the photoluminescence slightly increases (about 60%) and FWHM remains almost constant. The observed effect can be interpreted in terms of the low dose effect - the model accounting for the improvement of crystalline structure under the irradiation with low doses of gamma rays. In this model the explanation of properties improvement is based on the interplay between pre-existing defects and radiation-induced defects that leads to the curing of non-radiative pathways for photoexcited carriers. Results on the temperature dependencies of the photoluminescence spectra support this interpretation: the activation energies of PL lines also remain unchanged under gamma-treatment. Thus, one can conclude that gamma treatment in the low dose range does not change the nature of light-emitting species while the sub-system of non-radiative defects undergoes quite noticeable changes.

## Type of presence

**Author:** STRILCHUK, Oksana (V. Lashkaryov Institute of Semiconductor Physics, National Academy of Sciences of Ukraine, 45 Nauky Ave., Kyiv 03028, Ukraine)

**Co-authors:** Mr EVGEN GULE, Evgen (V. Lashkaryov Institute of Semiconductor Physics, National Academy of Sciences of Ukraine); Prof. RUDKO, Galuna (V. Lashkaryov Institute of Semiconductor Physics, National Academy of Sciences of Ukraine, National University "Kyiv-Mohyla Academy"); Prof. MAZUR, Yuriy (Institute of Nano Science and Engineering, University of Arkansas,)

**Presenter:** STRILCHUK, Oksana (V. Lashkaryov Institute of Semiconductor Physics, National Academy of Sciences of Ukraine, 45 Nauky Ave., Kyiv 03028, Ukraine)

**Session Classification:** Poster Session