PACS 78.30.Fs

# SOME PROBLEMS OF MODELLING THE RELAXED OPTICAL PROCESSES IN INDIUM ANTIMONITE AND INDIUM ARSENIDE

**Trokhimchuck P., Fedik B.**

*Anatolii Svidzinskii Department of Theoretical and Computer Physics, Lesya Ukrainka Volyn National University, Voly av. 13, Lutsk, Ukraine, 43025*

trope1650@gmail.com, Trokhimchuck.Petro@vnu.edu.ua, fedikbogdan@gmail.com

We present the simplest models of Relaxed Optics that explain the regularities of the distribution profiles of donor centers in indium antimonite and indium arsenide after irradiation with 20 ns pulses of a Ruby laser [1-4]. These models have the kinetic and dynamic nature and can be carried out using a modified system of equations for the internal photoeffect [1-3]. Only change non-equilibrium processes must be change to irreversible ones.

At the same time, the main physical characteristics are the processes of kinetic formation of irreversible changes in irradiated materials (in the case of antimonide and indium arsenide, these are two-photon processes), and the dynamic ones are thermodiffusion processes [1-3]. As diffusion coefficients, phenomenological diffusion coefficients can be selected, referring to specific experimental data (one-diffusion approximation); or for double compounds the photostimulated diffusion (self-diffusion) coefficients of the material components (indium and antimony for indium antimonide, indium and arsenic for indium arsenide) [1-4].

In the single-diffusion approximation, the problem of the "tail" parts of the distribution of the induced radiation of a 20 ns Ruby laser in indium antimonite and indium arsenide is poorly explained [1-3].

The two-diffusion approximation explains both the problem of the emergence of donor centers and their further evolution, including the nature of the tail parts of the distribution profiles [1-3].

The disadvantages of this modeling method include the problem of irreversible changes in the irradiated material. It is most simply explained using the methods of physical chemistry and crystallography (saturation model of the corresponding type and number of bonds in the excitation saturation mode) [1-3]. In this case, a two-dimensional lattice of sphalerite is used. It should be noted that the problem of studying the intrinsic absorption of light of high intensities in solids is rather poorly studied [1-3]. As a rule, attention is paid only to the radiative relaxation of primary excitations. Irreversible processes are dealt with by radiation physics of a solid body, which, as a rule, focuses on photostimulated subthreshold defect formation. For quantum electronics, self-absorption processes are too rigid, and for radiation physics, solids are too soft. Therefore, there is a need to find other more effective modeling methods.

However, the matter changes significantly when the light fluxes become significantly larger [1, 3]. It is appropriate to use the modeling methods given here for such processes.

## *References*

1. Trokhimchuck P. P. Foundations of Relaxed Optics. Lutsk: Volyn University Press Vezha, 2011. 627 p.
2. Trokhimchuck P. P. Nonlinear and Relaxed Optical Processes. Problems of Interactions. Lutsk: Vezha-Print, 2013. 280 p.
3. Trokhimchuck P. P. Relaxed Optics: Realities and Perspectives. Saarbrukken: Lambert Academic Publishing, 2016. 250 p.
4. Trokhimchuck P. P. Mathematical Foundations of Knowledge. Polymetrical Doctrine. Lutsk: Vezha-Print, 2014. 624 p. (In Ukrainian)