DOCTOR IGOR DOBYNDE THE DEVOTED KNIGHT OF SCIENCE

Igor Dobynde graduated from the Technical University of Moldova in 1977. After that, for some years, he improved his skills at the M.V. Lomonosov Moscow State University, at the chair of the physics of semiconductors guided by Prof. V.S. Dneprovskii. After returning to Kishinev, he worked at the Institute of Applied Physics of the Academy of Sciences of Moldova with specialization in the field of picosecond optical spectroscopy of semiconductors. These investigations were conducted using special equipment containing an Agat strike-camera and providing the registration of the time evolution of the luminescence process at a picosecond time resolution. These measurements require a high precision in the optical and mechanical parts of the installation and a continuous improvement to maintain the optical–kinetic complex in the working state. Only the exceptional devotion to science demonstrated by Igor Dobynde for about 40 years made it possible to provide these conditions. Another exceptional feature of his scientific style was high requirements for the verity of scientific results; he subjected his results to multiple verifications. It is no wonder that Igor Dobynde defended his doctor of physics thesis much latter than his colleagues of the same age did. However, as a recompense of his exigency, the honorable official opponents estimated his doctoral thesis as exceeding the usual requirements addressed to the candidatus scientiarum degree two- or threefold. Last years, he intended to enlarge these results and present them as a doctor habilitat thesis.

The entire scientific life of Dr. Igor Dobynde was dedicated to the investigations of the optical properties of semiconductors under a high level of laser excitation. The mean scientific results concern the kinetic processes with participation of high density of nonequilibrium charge carriers (NCCs). These processes are developing in a short and ultrashort interval of time (hundreds of picoseconds).

The theoretical interpretation of the obtain results was performed in collaboration with Prof. Igor Beloussov and in multiple discussions with Prof. Piotr Khadzhi and with the participants at the seminars of the laboratory.

The phononless Auger recombination processes were revealed. They take place, for example, when two indirect excitons accumulated at the electron valley minima situated at the opposite points at the boundary of the Brillouin zone take part in radiative recombination. The emitted photon appears as a result of the annihilation of one indirect exciton from one valley accompanied by the transformation of the second indirect exciton from the opposite valley into the direct exciton at the Γ point of the Brillouin zone.

Another impressive result was a considerable shift—by 25 meV—of the forbidden energy band gap edge after the ultrashort laser excitation of a semiconductor. It takes place due to the formation of the electron–hole plasma from the NCC. It leads to the lowering of the energy per one electron–hole pair in the frame of plasma and disappears in an interval of time of about 50 ps after excitation together with the annihilation of plasma. The observed phenomenon was proposed for implementation as an optical breech-block. Time-resolved spectroscopy permitted Dr. Dobynde, who began with his work at the M.V. Lomonosov Moscow State University and continued at the Institute of Applied Physics, to reveal a spectacular process of the relaxation of the NCC between the levels of the size quantization in the system of quantum dots excited by an ultrashort laser pulse. The charged carriers excited initially on the upper levels of the size quantization and step-by-step changed their occupation numbers gradually lowering their positions on the energy scale. The Pauli principle interdicts the excitation of the new carriers on the occupied energy levels, leading to high transparency without absorption of light propagating in this spectral region. It permits the absorption of light with frequencies corresponding to the transitions on the nonoccupied energy levels, leading to small transparency in this case.

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