

SPECTRA AND KINETICS OF LUMINESCENCE OF NATURAL DIAMOND TYPE IIA UNDER OPTICAL INTERZONE EXCITATION *

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A diamond of type IIA was studied, in the absorption spectrum of which in the region of 200–1000 nm there were no bands and lines of impurity or impurity – vacancy centers. Only intrinsic interband absorption was observed. Interband excitation of luminescence was provided by pulsed radiation of the fifth harmonic of a neodymium laser (213 nm, 7 ns). In addition, to search for the luminescence centers contained in the crystal, intracenter excitation was used with the fourth (266 nm) and second (532 nm) harmonics of this laser. Additionally, a set of picosecond lasers (375, 405, 470, 532 and 640 nm) was used, which were included in the kit of a confocal scanning luminescent microscope with a time resolution of MicroTime 200 from PicoQuant gmbh, which operated in a time-correlated photon counting mode. The luminescence spectra were measured using an Ocean Optics QE65000 spectrofluorimeter coupled to this microscope. The luminescence kinetics in the case of intracenter excitation was measured by means of a microscope, and in the case of interband excitation, by the method of direct oscillography using a photomultiplier and a digital oscilloscope. The sample temperature (78-500 K) was maintained and measured using a Microstat-N cryostat from Oxford Instruments.

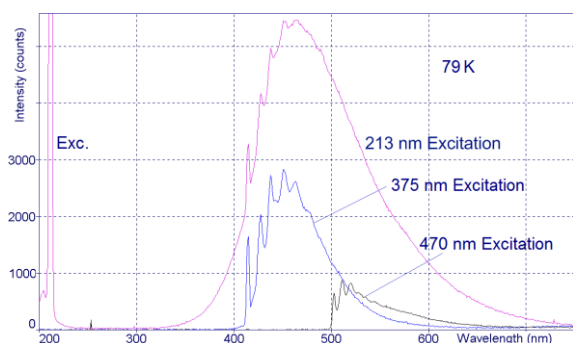


Fig. 1. Luminescence spectra under optical interband and intracenter excitation at 79 K

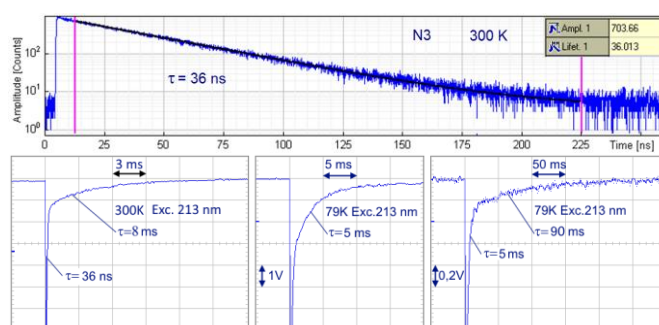


Fig. 2. Kinetics of luminescence during interband and intracenter excitation at 300 and 79 K

Some measurement results are presented in FIG. 1 and FIG. 2. By luminescence, N3, H3, and others centers were detected in the crystal. Upon interband excitation, a glow of N3 centers is observed, as can be seen in Fig. 1 by the characteristic structure of its spectrum. The luminescence spectrum of these centers is superimposed on a wide structureless band. The characteristic luminescence kinetics in this band (8 ms at 300 K, 5 and 90 ms at 79 K) confirms [1-4] that this is the A band of recombination luminescence.

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