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SUPERLUMINESCENCE OF NV CENTERS IN DIAMOND PUMPED BY THE SECOND HARMONIC OF A ND:YAG LASER *

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In the light of the creation of a diamond laser [1], an urgent task is to determine the characteristics of diamonds in order to determine the range in which such lasers can be created not in isolated cases. This work is aimed at creating superluminescence in diamond under the action of optical pumping by the second harmonic of an ND:YAG laser (λ=532nm).

At a pump intensity above ~2.0 MW/cm^2 in the spectral region of 700–760 nm, against the background of the spontaneous luminescence spectrum, a nonlinear increase in intensity was detected in the HPHT diamond sample upon pulsed excitation by an ND:YAG laser, and with a further increase in the pump intensity, this band turns into an intense a peak with a maximum at about 718 nm. The FWHM of this peak increased from 13 to 19 nm as the pump intensity increased from 2.7 to 46 MW/cm^2. At high pump intensities, nonlinearities were found in the absorption and accumulation of NV centers in the excited state. Superluminescence was observed only in separate growth zones of the crystal.

The calculation of the position of the photoluminescence band, carried out taking into account the intrinsic absorption spectrum of the crystal, is close to the experimental one. On fig. 1 against the background of the absorption spectrum shows the calculated emission spectra calculated at inversion densities N*(cm^{-3}) = 1·10^{17}; 2·10^{17}; 2.5·10^{17}cm^{-3} and medium length 1 cm.

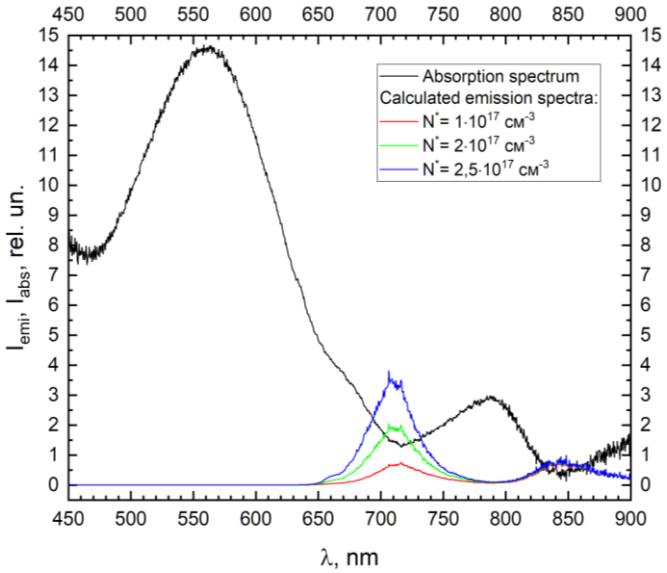

Fig.1. Absorption spectrum and calculated emission spectra.

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