Nonlinear photoexcitation of photoluminescence in the bulk of natural and synthetic diamonds

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At present, innovative methods for characterizing optically transparent materials are rapidly developing, including the determination of the optical parameters of the material, the study of its unique properties, as well as the study of various defects in bulk. In this work numerous experiments have been carried out to study the mechanisms of nonlinear optical effects in the bulk of diamonds [1, 2]. Ultrashort laser pulses of various energies and durations were used to excite photoluminescence in the UV and blue ranges of radiation. Different focusing (NA from 0.25 to 0.65) of femto- and picosecond laser pulses also allowed to adjust the energy density in the focused spot and to study the nonlinearity (multiphoton processes) of the photoluminescence yield process. The connection between the different modes of photoluminescence and the dynamics of the charge carriers occurring by one mechanism or another was studied.

[1] Kudryashov S, Danilov P, Smirnov N, Levchenko A, Kovalev M, Gulina Y, Kovalchuk O and Ionin A 2021 *Opt. Mater. Express* **11** 2505–2513
[2] Kudryashov S, Stsepuro N, Danilov P, Smirnov N, Levchenko A and Kovalev M 2021 *Opt. Mater. Express* **11** 2234–2241