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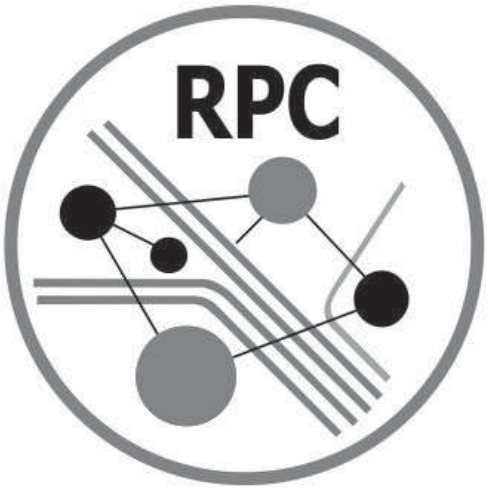

EXCITONIC STATES IN DIAMOND IN THE SPECTRA OF OPTICAL ABSORPTION AND LUMINESCENCE [1]

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Diamond is a promising material for electronics, the element base of which is capable to endure high doses of ionizing radiation, prolonged thermal loads and chemically aggressive media, i.e. for military and space applications, as well as in the field of high-current electronics.

The binding energy of a free exciton in diamond is 80.5 meV. Therefore, it is energetically favorable for the injected or photogenerated electron-hole pairs in diamond to form free excitons at temperatures up to 350 ° C. It is known that free excitons have an effect on the ideality factor of p-i-n diamond-based diodes [1].

Recent studies have shown the exciton state splitting due to the spin-orbit and exchange interaction and the anisotropy of the carrier masses [2]. In general, the full spectrum of exciton states is still poorly investigated. We managed to find only one paper in which the data on the temperature dependence of the edge absorption of diamond are given [3].

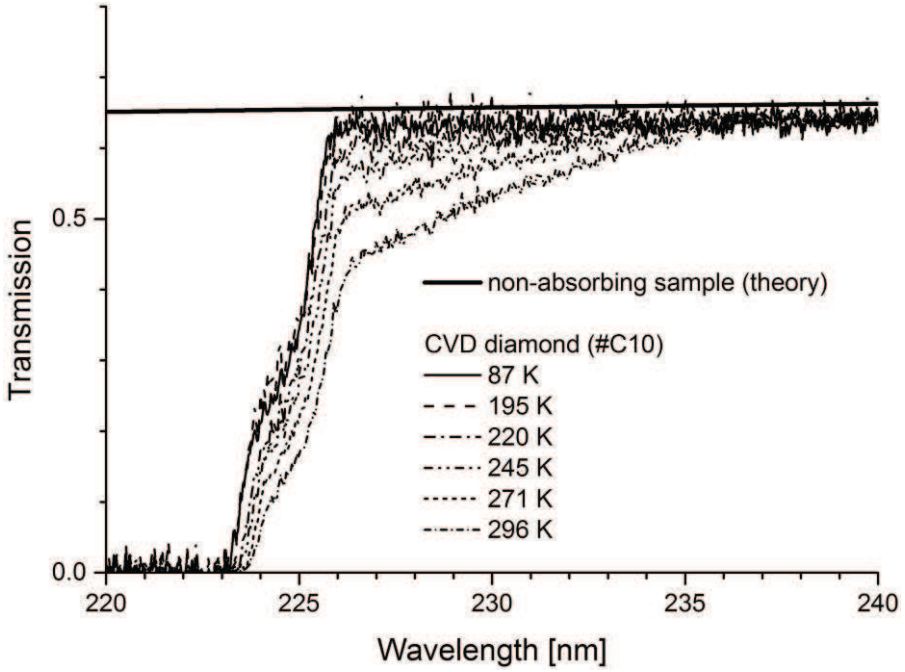

Fig. 1. Transmission spectra of the theoretical non-absorbing diamond and the CVD diamond sample #C10 at different temperatures.

In this paper, the results of studies of optical absorption near the diamond absorption edge are presented as a function of temperature from 80 to 300 K for several samples of natural and synthetic origin. A comparison of the results obtained with the photoluminescence spectra in the region of radiative recombination of free excitons of the same samples allows one to draw conclusions about the different relative contribution of phonon modes for the negative and positive branches of exciton absorption and edge luminescence.

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[3] *Clark C.D., Dean P.J., Harris P.V.* // Proceedings of the royal society of London A. – 1964. – 277. – 312-329.

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