

RECHARGING OF NV^0 AND N_2V^0 COLOR CENTERS IN HPHT DIAMONDS IN PROCESS OF ELECTROLUMINESCENCE

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When measuring the electroluminescence spectra of diamond samples C122 and C130, it was discovered that, upon electrical pumping, the color centers NV^0 and N_2V^0 [1] are recharged, which manifests itself in the form of an increase in the luminescence bands of NV-NE2 and a weakening of NV^0 and N_2V^0 .

Electroluminescence, within the sensitivity of the spectrometer, was observed in samples C122 and C130 when voltages were applied at 190 V and 210 V, respectively. For comparison, the spectra of cathodoluminescence (high-current electron beam 2 ns up to 220 keV) and photoluminescence (continuous laser 405 nm 10 mW/cm²) were measured.

Electroluminescence, cathodoluminescence and photoluminescence spectra were recorded at room temperature. Figure 1 shows the spectra of electroluminescence, photoluminescence and cathodoluminescence.

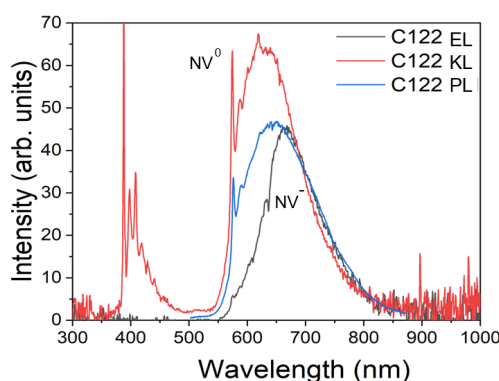


Fig.1. Electroluminescence, photoluminescence and cathodoluminescence spectra of the C122 diamond sample.

In the electroluminescence spectrum, a luminescence band of the NV^- center, ZPL (zero-phonon line) at 637 nm is observed (NV^- is indicated in the figure). In the cathodoluminescence and photoluminescence spectra there is a glow from the NV^0 center, with ZPL at 575 nm (NV^0 is indicated in the figure)[2].

The report discusses the mechanisms of charge exchange and ionization of color centers during electroluminescence.

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REFERENCES

- [1] The Tomsk State University Development Program (Priority 2030), project №2.4.4.23
- [2] Zaitsev A.M., Optical Properties of Diamond, Data Handbook. (Springer Berlin: Heidelberg, 2001); doi: 10.1007/978-3-662-04548-0Z.