BLIND MIRROR BASED ON PHOTONIC CRYSTAL STRUCTURES FOR DIAMOND LASER

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It is known that, at the moment, laser generation has been achieved in NV^{-} color centers in diamonds, with a generation wavelength of $\lambda \approx 720$ nm [1]. The generated pulse energy is approximately 50 μJ, with an optical pumping pulse energy of about 5.5 mJ, which corresponds to an efficiency of about 1% for the system [2].

However, the feedback provided by Fresnel reflection from the facets of the diamond is insufficient, which is why it is necessary to use an optical resonator in order to achieve the optimal feedback value. Using classical resonators based on external mirrors is not feasible due to the small geometric dimensions of the active diamond element (measured in millimeters) and the complexity of adjusting such a system.

This problem can be solved by creating a mirror with the desired reflection coefficient in a specific wavelength range directly on the surface of a diamond active element. A multilayer mirror, also known as a one-dimensional photonic crystal, can be "tuned" to the required reflection coefficient and wavelength range by adjusting the optimal parameters during its creation process.

This paper presents the results of increasing the energy of the laser pulse and the efficiency of a diamond laser by creating a reflective surface on one of the facets of a diamond laser element for the wavelength range λ = 710-730 nm. Figure 1 shows the dependence of the energy of the generation pulse on the energy of the pumping pulse for a diamond laser element with a blind mirror at the one of the facets.

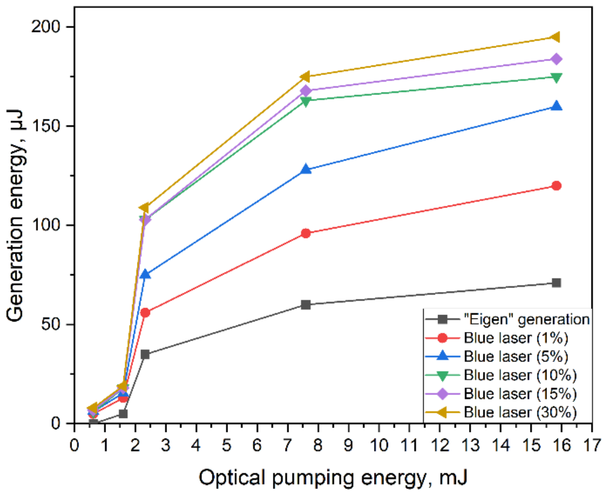

Fig.1. Dependence of the generation energy on the optical pumping energy

Figure 1 shows the relationship between the energy generated by a diamond laser and the optical pumping power, with a blind mirror at one end, under the influence of low-intensity, short-wavelength light [3].

REFERENCES

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[3] Invention patent № 2813650 «A method for increasing the generation energy of a diamond NV^{-} laser», authors: Burachenko A.G., Vince V.G., Genin D.E., Eliseev A.P., Lipatov E.I., Ripenko V.S., Savvin A.D., Shulepov M.A., date of application 19.12.2022.