ABSORPTION SPECTRA OF SINTHETIC DIAMONDS IIA TYPE IN THE TEMPERATURE RANGE FROM 12K TO 460K *

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Paper is devoted to the calculation of synthetic HPHT diamonds absorption spectra obtained at temperatures from 12 to 460 K. Variouse methods for determining the band gap for synthetic samples at a temperature of 12 K are also considered. The methods discussed in this paper allow us to more accurately determine the band gap of diamonds.

We used 8 pure HPHT diamonds with concentration of N<10 ppm in our experiments. The transmission spectra of the samples were recorded on a helium cryostat at temperatures from 12 to 460 K by using optical spectrometer HR 4000 in spectral range 200-300 nm, and then the absorption values were calculated using following formula:

$$T(\lambda) = \frac{(1 - r(\lambda))^2 \cdot e^{-\alpha(\lambda)d}}{1 - r(\lambda)^2 \cdot e^{-2\alpha(\lambda)d}}, \quad (1)$$

where T(λ) is the transmission coefficient, r(λ) is the reflection coefficient from one face, and α(λ) is the absorption index. Transmission of samples was obtained from cryostat experiments; reflection coefficient was calculated from [2].

We consider 5 methods [1] for determining the band gap values. Figure 1 shows a graph of the obtained results.

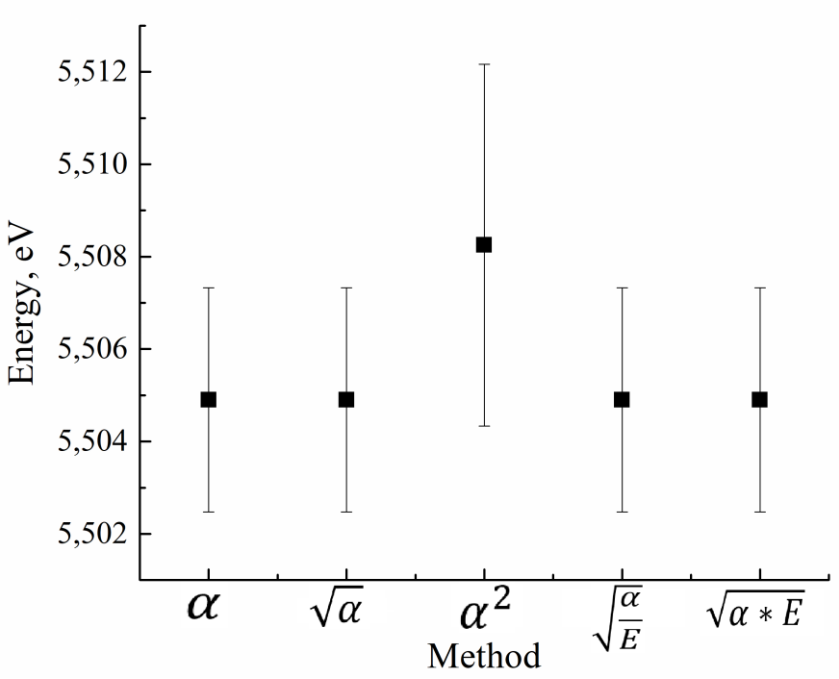

Fig.1. Energy of the band gap determined by various methods

The absorption spectra of pure diamonds (N<10 ppm) are obtained in the temperature range from 12K to 460K, and the band gap of such diamonds is determined to be 5.505 eV.

REFERENCES

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