CVD dimanta kristālu Ramana spektru analīze dažādiem ierosmes viļņa garumiem

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Dimanta kristāliem atkarībā no to izmēriem un kristāliskajiem defektiem piemīt plašas pielietojuma iespējas. Darba gaitā tika apskatīti dimanta paraugi, kas tika audzēti ar ķīmisko tvaiku nogulsnēšanas metodi (CVD) uz Si pamatnes virsmas. Paraugā ar optisko mikroskopu tika novēroti mikroskopiski telpiskie defekti.
Izmantojot Ramana spektrometru, tika izmērīti CVD dimanta Ramana spektri ar 532 nm un 785 nm ierosmi. Tika noteikta korelācija starp dimantā esošajiem defektiem un iegūto Ramana spektru joslu pozīcijām. Dimanta paraugu spektriem 785 nm ierosmes gadījumā tika konstatētas vairākas joslas 0-1330 cm^{-1} apgabalā, kuras tika salīdzinātas ar 532 nm ierosmes dimanta Ramana spektriem. Tika izanalizēta 0-1330 cm^{-1} apgabala joslu izcelsme, kā arī to saistība ar izvēlēto ierosmes starojuma viļņa garumu. Ar CVD metodi iegūtie dimanta paraugu Ramana spektri tika salīdzināti ar references parauga – augstas kvalitātes dimanta monokristāla Ramana spektriem.
Iegūtie rezultāti ļauj raksturot defektus, kas piemīt ar CVD metodi sintezētajiem dimanta paraugiem, kā arī noteikt dimanta Ramana spektra 0-1330 cm^{-1} apgabala joslu izcelsmi.

Raman spectra analysis of CVD diamond crystals for different excitation wavelengths

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Depending on their size and crystalline defects, diamond crystals have a wide range of applications. In the course of the work, several samples of diamond grown by chemical vapor deposition (CVD) on the surface of a Si substrate were studied. In all obtained samples, microscopic spatial defects were observed by optical microscope.
In this work, the Raman spectra of the CVD diamond were measured at 532 nm and 785 nm excitation. A clear correlation between the diamond defects and the corresponding Raman peak positions was found. Furthermore, in the case of 785 nm excitation, several new Raman bands in the 0-1330 cm^{-1} region were found, which were compared with the corresponding Raman spectra at 532 nm excitation. The origin of the observed bands in the above-mentioned "0-1330 cm^{-1}" region was analyzed and compared with available literature data. In addition, comparison of Raman spectra obtained at different excitation wavelength was performed. Finally, the obtained Raman spectra of the CVD diamond samples were compared with that of the reference sample – a high-quality diamond single crystal.
The obtained results allow to characterize defects of diamond samples synthesized by the CVD method, as well as to determine the origin of the bands in the 0-1330 cm^{-1} region of the diamond Raman spectrum.