SPECTRAL-KINETIC RADIATION CHARACTERISTICS OF DIAMOND SAMPLES UNDER THE ACTION OF ELECTRON BEAMS WITH AN ENERGY OF TENS OF KEV-UNIT MEV *

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Detection of high-energy particle flows under conditions of high temperatures and high background radiation is very important in controlled thermonuclear fusion installations, as well as in near-Earth space. The most promising material for use in high-energy particle detectors, which has high temperature and radiation resistance, is diamond. In these areas of application of such detectors, the electron energy can range from tens to hundreds of keV to units of MeV. It is known that at such electron energies, both cathodoluminescence (CL) and Cherenkov radiation (CR) can be excited in diamond. In addition, the impurity-defect composition of the diamond sample used affects its spectral and kinetic radiation characteristics. Therefore, the goal of this work was to study the spectral and kinetic radiation characteristics of diamond samples with different impurity-defect compositions in the energy range of tens of keV-units MeV.

It has been shown that when exposed to electron beams with energies of tens to hundreds of keV, the main contribution to the luminescence spectra of diamond samples is made by CL, and the intensity of the CR is low. When exposed to electron beams with an energy of 5.7 MeV, CR using a photomultiplier was recorded in all diamond samples with good transparency in the UV region of the spectrum. In addition, numerical simulation of CR in diamond was carried out using the GEANT4 software code using the Monte Carlo method, which is in good agreement with the experimental results obtained.

The results of the study will be useful in the calibration and design of electron detectors operating on the basis of diamond under conditions of high temperatures and high background radiation.

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