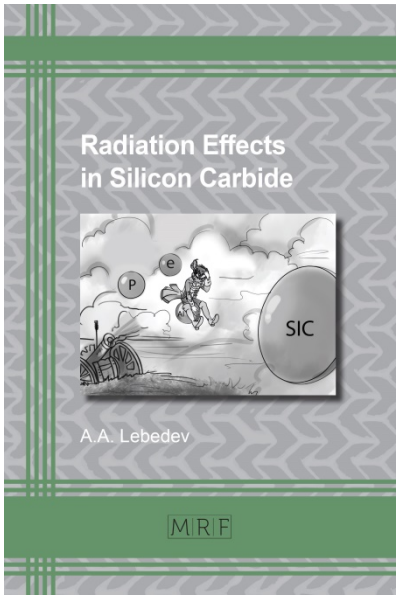
New Book Information

Materials Science
Solid State Physics and Engineering

Radiation Effects in Silicon Carbide



A.A. Lebedev

Handbook

The book reviews the most interesting, in the author's opinion, publications concerned with radiation defects formed in 6H-, 4H-, and 3C-SiC under irradiation with electrons, neutrons, and some kinds of ions. At the beginning, the SiC electrical parameters making this material promising for application in modern electronics are discussed.

Keywords: Silicon Carbide, Defects, Carrier Recombination, Annealing, Detectors, Electron Irradiation, Neutron Irradiation, Ion Irradiation

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Summary:

The book reviews the most interesting, in the author's opinion, publications concerned with radiation defects formed in 6H-, 4H-, and 3C-SiC under irradiation with electrons, neutrons, and some kinds of ions. At the beginning, the SiC electrical parameters making this material promising for application in modern electronics are discussed. Specific features of the crystal structure of SiC are also considered. It is shown that, when wide-bandgap semiconductors are studied, it is necessary to take into account the temperature dependence of the carrier removal rate (ηe), which is a standard parameter for determining the radiation hardness of semiconductors. The ηe values obtained by irradiation of various SiC polytypes with n- and p-type of conductivity are analyzed in relation to the type and energy of irradiating particles. The possible physical mechanisms of compensation of the given material are considered. The influence exerted by the energy of charged particles on how radiation defects are formed and conductivity is compensated in semiconductors under irradiation is analyzed.

Further, the possibility to produce controlled transformation of silicon carbide polytype is considered. The involvement of radiation defects in radiative and nonradiative recombination processes in SiC is analyzed.

Data are also presented regarding the degradation of particular SiC electronic devices under the influence of radiation and a conclusion is made regarding the radiation resistance of SiC. Lastly, the radiation hardness of devices based on silicon and silicon carbide are compared.

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