INFLUENCE OF HEAT TREATMENTS ON RECOMBINATION PROPERTIES OF CUBIC SILICON CARBIDE

V. Ya. Bratus, V. N. Rodionov[1]

Institute of Semiconductor Physics,
Nat. Acad. Sci. of Ukraine
(45, Nauky Prosp., Kyiv 03028),
[1]National Ukrainian Technical University
'Kyiv Polytechnic Institute"
(39, Peremogy Prosp., Kyiv 03056)

S u m m a r y

The influence of heat treatments on the radiative annihilation of free excitons and nonradiative recombination of electrons and holes in cubic silicon carbide has been determined by photoconductivity, photoluminescence, and electron paramagnetic resonance (EPR). The use of the thermal treatment regime giving rise to an increase by several times of radiative efficiency decreases a photoresponse of the band associated with acceptors having an optical ionization energy of 0.48 eV and decreases the concentration of uncompensated nitrogen donors and electrons in the conduction band. The results are explained under the assumption that a complexation of nitrogen atoms with the acceptors mentioned above occurs resulting in the creation of a new deep recombination center. This gives rise to an increase in the hole lifetime and quantum efficiency of exciton luminescence. Invariability of the EPR lineshape with significant reduction of the uncompensated nitrogen concentration may be attributed to both its inhomogeneous distribution and indirect exchange interaction of nitrogen donor electrons via more shallow donors.