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Impact of gamma-irradiation on the properties of n-type AlGaN/GaN heterostructures ELENA FLITSIYAN, LEONID CHERNYAK, University of Central Florida — Gamma-photon irradiation of AlGaN/GaN HEMTs with the modest dose of 700 Gy* resulted in significant deterioration of their DC characteristics. To understand the nature of the observed effect, we carried out a series of variable temperature EBIC measurements in the vicinity of HEMT's gate in-situ in Scanning Electron Microscope. The measurements were performed on 3 different devices, which were exposed to various gamma-irradiation doses. Temperature dependent EBIC measurements allowed obtaining activation energies for levels in the material's forbidden gap, which are responsible for carrier recombination. While the diffusion length decreases significantly with increasing irradiation dose, the activation energy, associated with carrier recombination, gets larger. This fact indicates generation of new deep levels caused by gamma-photon irradiation. These levels act as traps for electrons in AlGaN/GaN HEMT channel, thus reducing the drain current and leading to degradation of other device characteristics. The investigated effects of gamma irradiation are likely related to, epitaxial layer quality and composition. Therefore, the study of materials with variations in these properties is necessary to fully understand the irradiation-induced mechanisms.

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