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Effect of proton radiation on gallium nitride light emitting diodes

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Abstract

The compound semiconductor gallium nitride offers enormous potential for facilitating economic expansion in the silicon-based semiconductor industry, which is currently seeing decreasing performance returns compared to investment costs. Its high electron mobility and electric field strength at the material level have already demonstrated enormous potential for photonics and high-frequency communications applications. However, its application in devices used in the radiation-prone environment is hindered by degradation and failure caused by the radiation. In this paper, the effect of proton radiation on the electrical properties of InGaN light emitting diodes (LEDs) for the fluence range of 1×10^{14} cm⁻² to 3×10^{14} cm⁻² is performed. On comparing the results before and after radiation, it is found that radiation mainly affected the reverse IV characteristics of the device with little or no effect on forward IV or CV characteristics. Apart from the electric properties, the optical properties of the LEDs show improvement after radiation as the light intensity increases post-irradiation. © 2024, Institute of Advanced Engineering and Science. All rights reserved.

Author Keywords

Degradation; Indium gallium nitride; Light emitting diodes; Proton; Radiation

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