World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:16, No:02, 2022

Investigation of the Effects of Gamma Radiation on the Electrically Active Defects in InAs/InGaAs Quantum Dots Laser Structures Grown by Molecular Beam Epitaxy on GaAs Substrates Using Deep Level Transient Spectroscopy

Authors : M. Al Huwayz, A. Salhi, S. Alhassan, S. Alotaibi, A. Almalki, M.Almunyif, A. Alhassni, M. Henini

Abstract : Recently, there has been much research carried out to investigate quantum dots (QDs) lasers with the aim to increase the gain of quantum well lasers. However, one of the difficulties with these structures is that electrically active defects can lead to serious issues in the performance of these devices. It is therefore essential to fully understand the types of defects introduced during the growth and/or the fabrication process. In this study, the effects of Gamma radiation on the electrically active defects in p-i-n InAs/InGaAsQDs laser structures grown by Molecular Beam Epitaxy (MBE) technique on GaAs substrates were investigated. Deep Level Transient Spectroscopy (DLTS), current-voltage (I-V), and capacitance-voltage (C-V) measurements were performed to explore these effects on the electrical properties of these QDs lasers. I-V measurements showed that as-grown sample had better electrical properties than the irradiated sample. However, DLTS and Laplace DLTS measurements at different reverse biases revealed that the defects in the-region of the p-i-n structures were decreased in the irradiated sample. In both samples, a trap with an activation energy of ~ 0.21 eV was assigned to the well-known defect M1 in GaAs layers

Keywords : quantum dots laser structures, gamma radiation, DLTS, defects, nAs/IngaAs
Conference Title : ICCSTMDC 2022 : International Conference on Compound Semiconductor Technologies: Materials, Devices and Circuits
Conference Location : London, United Kingdom
Conference Dates : February 15-16, 2022