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Neutron Radiation Effects on the Electrical Characteristics of InAs/GaAs Quantum Dot-in-a-Well Structures (Conference Paper)

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Abstract

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This paper studies the effects of neutron radiation on the electrical behaviour and leakage current mechanism of quantum dot-in-a-well (DWELL) semiconductor diodes with fluence ranging from 3 to 9 times 10{13}hbox{neutron/cm}^{2}. After neutron irradiation, the forward bias and reverse bias leakage currents showed significant rise approximately of up to two orders of magnitude which is believed to be attributed to the presence of displacement damage induced traps. The ideality factor of the forward bias leakage current corresponding to all neutron fluence irradiations were found to be close to 2, suggesting that the forward bias current mechanism is largely due to trap-assisted generation-recombination (TAGR) of carriers. Subsequently, it is also observed that the capacitances reduced after irradiations which were further shown to be due to the deep carrier trapping effects and the Neutron Transmutation Doping effects (NTD). From the temperature dependence measurements, it is found that the reverse bias leakage current mechanisms of the irradiated samples are primarily attributed to two process; TAGR of carriers with emission from the traps assisted by the Frenkel-Poole (F-P). The traps due to both mechanisms were derived and shown to increase with neutron fluence. © 1963-2012 IEEE.

Author keywords

III-V semiconductor materials neutron radiation effects quantum dots quantum wells semiconductor nanostructures

Indexed keywords

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