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Neutron Displacement ⋯ ⋯ WITHDRAW

Gallium nitride (GaN) materials have attracted significant attention for neutron detection and related applications due to their exceptional advantages including high-temperature tolerance, high-voltage resistance, rapid response characteristics, etc. The evaluation of irradiation damage and radiation-hardened design for GaN-based devices remains a critical research focus. GaN detector configurations are primarily categorized into two types: multilayer planar structures and AlGaN/GaN heterojunction architectures. This study investigates GaN PIN diodes and AlGaN/GaN high-electron-mobility transistors (HEMTs) fabricated on silicon substrates. Systematic neutron irradiation experiments were conducted to characterize the degradation patterns of electrical performance parameters in these devices post-irradiation. Through TCAD (Technology Computer-Aided Design) simulations, the physical mechanisms underlying irradiation-induced damage were thoroughly analyzed. Furthermore, a comparative assessment of radiation resistance between GaN-based devices and conventional silicon-based counterparts was performed, providing critical insights into the radiation tolerance disparities between these material systems.

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