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Impact of neutron irradiation on carrier dynamics in high-quality epitaxial GaN

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Gallium nitride (GaN) is a key semiconductor material for optoelectronic and high-power applications such as light-emitting diodes (LEDs), laser diodes, and high electron mobility transistors (HEMTs). Owing to its wide bandgap (3.4 eV), high thermal stability, and large displacement energy, GaN is also a promising candidate for ionizing radiation detection under extreme conditions. For such applications, high crystalline quality with low unintentional doping and low dislocation density is essential, which can be achieved by epitaxial growth on native GaN substrates.
In this study, GaN epitaxial layers grown on ammonothermal GaN substrates were fabricated at the Institute of High Pressure Physics, Polish Academy of Sciences (UNIPRESS), within the framework of DRD3 project "Development of radiation-hard GaN devices for MIP detection."The samples were subjected to neutron irradiation at the Ljubljana TRIGA reactor with fluences ranging from 1e12 to 1e17 cm-2.
To assess the effects of irradiation-induced defects, carrier recombination dynamics were investigated using contactless microwave-probed photoconductivity transients and femtosecond pump-probe techniques. Complementary photoluminescence measurements were performed to evaluate changes in optical properties. The correlation between neutron fluence, carrier lifetime, and PL response provides insight into defect generation and its impact on the optoelectronic quality of GaN.

Type of presentation (in-person/online)

in-person presentation

Type of presentation (I. scientific results or II. project proposal)

I. Presentation on scientific results

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