Abstract Submitted
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Fe charge state kinetics in semi-insulating Fe-doped GaN[1] USTUN SUNAY, Author/ presenter, JAMIYANAA DASHDORJ, Author/ Co-author, MARY ELLEN, Co-author / Advisor, KEVIN UDWARY, JACOB LEACH, Co-author/ grew samples — GaN is a wide bandgap semiconductor with applications in LEDs and high-power devices. One of the problems plaguing this material is a high concentration of residual donors. This issue can be resolved by doping GaN with deep acceptors such as Fe, which compensates donors and creates semi-insulating material. Recently, a photo-induced electron paramagnetic resonance (EPR) spectroscopy study of Fe-doped GaN showed significantly long relaxation times [1]. The study proposed a charge transfer mechanism between Fe^{3+} and Fe^{4+} as an explanation for the phenomenon. However, absorption data from the same samples showed the existence of both Fe^{2+} and Fe^{3+} which suggests that the proposed model involving Fe^{4+} is incorrect and a theory involving an intermediate center is more likely. 3.5 K 10 GHz EPR was performed on HVPE grown free-standing Fe/Si co-doped GaN. Data show an unexpected situation where both donor and Fe^{3+} acceptor signals exist simultaneously. Together with the photo-EPR results, these data reinforce the necessity of invoking a multi-step mechanism for compensation. A model for compensation based on charge transfer between Fe3+ and a donor will be described based on EPR and additional material characterization measurements.

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