

Abstract Submitted
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Excitation mechanisms of rare-earth ions in GaN¹ Z. FLEISCHMAN, S. PENN, L. MAURER, Z. DONG, V. DIEROLF, Lehigh University — Understanding the excitation mechanisms of rare earth ions in GaN is key to achieving more efficient EL emission from devices based on this material system. For that purpose, we performed site-selective photo- and cathodo-luminescence spectroscopy on Eu-doped GaN layers. We identified 8 different Eu environments, which are excited after the creation of electron-hole pairs through excitation channels with drastically different transfer efficiencies. In particular, we find one majority site and one minority site that is strongly coupled to an intrinsic GaN defect. For these most pronounced cases, resonant excitation shows that the majority site is 6 times more abundant than the defect-related site, while saturated CL data show only a factor of 3. This indicates that not all of the majority site ions are able to be excited electrically. We explain this and other observations with a model for the Eu excitation mechanism that involves two different intrinsic GaN defects acting as intermediate traps. We determined that the most efficiently excitable Eu are those near such a defect trap. Overall, this work shows that a higher population of defect traps in GaN is desirable for the most efficient rare earth luminescence.

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