

Abstract Submitted
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Cathodoluminescence Studies of Rare Earth Ions in LiNbO₃ and GaN¹ S. TAFON PENN, ZACK FLEISCHMANN, Dept. of Physics, Lehigh University, G.S. CARGILL, Dept. of Material Sciences, Lehigh University, V. DIEROLF, Dept. of Physics, Lehigh University — In most host materials, rare earth ions have intra-atomic transitions that exhibit a sensitivity to the local environment through the crystal field splitting of their Stark sub-levels and the modification of the free ion parameters (e.g.: Slater parameters). Moreover, in crystals that lack inversion symmetry the transitions exhibit linear Stark shifts that makes them good probes for local electric fields that are created for instance by local charging and a ferroelectric domain inversion. We present cathodoluminescence emission spectra of Eu³⁺ ions and Er³⁺ in two host materials (LiNbO₃ and GaN) for a temperature range between 12 and 300K using the electron beam in JEOL JSM-6400 SEM with a voltage of 10keV, various beam currents and beam scanning modes. We observe a pronounced saturation effect in the emission of the rare earth ions that depends on details of the scan mode, the electron beam deflection frequency, and magnification. The saturation effect is absent in the intrinsic emission of GaN that is recorded simultaneously. We will present an interpretation of the effect that takes into account charging effects and the excitation and relaxation dynamics of the free carriers and the rare earth ions.

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