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Magneto-Optical Studies of Rare Earth Doped III-V Nitrides BRANDON MITCHELL, NATHANIEL WOODWARD, JONATHAN POPLAWSKY, VOLKMAR DIEROLF, Lehigh University, H.X. JIANG, Texas Tech Institute — We investigated the site selective optical and magneto-optical properties of Neodymium doped Gallium and Aluminum Nitride and Erbium doped Gallium Nitride. For our current study, we applied magnetic fields parallel and antiparallel to the C-axis of the crystals and observed the resulting Zeeman splitting both in excitation and emission transitions. On the basis of these measurements, we determined the effective g-factors of all the states involved in the Nd^{3+} transitions. For erbium doping, we observed the Zeeman splitting of the $^4I_{13/2}$and $^4I_{15/2}$levels. Due to small crystal field splitting and large Zeeman splitting, the assignment of levels and corresponding g-factors is very complex. In addition, we observed unexpected asymmetries in the emission intensities when we compared the spectra obtained for fields parallel and antiparallel to the growth direction. The degree of this asymmetry depends on the substrate material and is unambiguously related to the strain and resulting internal fields that are induced by lattice mismatch. The asymmetry behavior parallels the ferromagnetic behavior that is induced by the rare earth ions in GaN and hence our observation suggests that magnetization can be controlled by strain.

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