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Enhancing erbium emission by strain engineering in GaN heteroepitaxial layers I-WEN FENG, JING LI, ASHOK SEDHAIN, JINGYU LIN, HONGXING JIANG, Texas Tech University, JOHN ZAVADA, North Carolina State University — Rare earth doped III-nitrides have been intensively studied due to their intra-$4f$ transitions covering the window from visible emissions to infrared wavelengths. Trivalent Erbium (Er^{3+}) has driven particular interests since the intra-$4f$ transition from its first excited ($^4I_{13/2}$) to the ground state ($^4I_{15/2}$) gives 1.54 μm emission, which sits in the low optical loss band of silica fibers and potentially affords light emitters and optical amplifiers at optical communication wavelength. Due to the structural and thermal stability of GaN, GaN appears to be the promising candidate as the host semiconductors. We prepared Er doped GaN (GaN:Er) samples by metal organic chemical vapor deposition. GaN:Er epilayers were simultaneously grown on different templates, including GaN/Al_2O_3, AlN/Al_2O_3, GaN/Si(111), and c-GaN bulk. The effects of stress, caused by the lattice mismatch between GaN:Er epilayers and the substrates, on the intensity of 1.54 μm emission were probed. The emission intensity at 1.54 μm increased with greater tensile stress in the c-direction of GaN:Er epilayers. The correlation between stress and 1.54 μm emission will be presented. The results implied the potential to design efficient photonic devices based on GaN:Er semiconductors.

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