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Optical properties of GaN/Er:GaN/GaN core-cladding planar waveguides[1] YAQIONG YAN, ZHENYU SUN, TREY SMITH, WEIPING ZHAO, JING LI, JINGYU LIN, HONGXING JIANG, Texas Tech University, TEXAS TECH NANOPHOTONICS TEAM[2] — Erbium doped GaN (Er:GaN) is a promising candidate as a gain medium for high energy lasers (HELs) operating at the retina-safe spectral region around 1.5 m due to outstanding thermal, mechanical and optical properties of GaN host. Compared to YAG, GaN has a much higher thermal conductivity of $\kappa \approx 253$ W/m•K and a smaller thermal expansion coefficient of $\alpha \approx 3.53$ x 10^{-6} C^{-1} and the potential to significantly outperform YAG based HELs. We report here the successful fabrication and optical characterization of GaN/Er:GaN/GaN core-cladding planar waveguides (PWGs). Optical confinement in the core layer has been investigated. The measured optical loss coefficients of Er:GaN PWGs at 1.54 m have been measured and are respectively 1.0 cm^{-1} for the transverse electric (TE) and 1.2 cm^{-1} for the transverse magnetic (TM) modes. Based on the observed transition lines, a detailed energy levels diagram in Er:GaN has been constructed. Approaches to further reduce the optical loss and optimal configuration for resonantly pump GaN/Er:GaN/GaN PWGs for achieving amplification near 1.5 m have been identified.

[1]Optical properties of GaN/Er:GaN/GaN core-cladding planar waveguides
[2]The Center for Nanophotonics is dedicated to the advancement of III-nitride wide bandgap semiconductors (BN, GaN, AlN, AlGaN, InGaN, and InAlGaN).

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