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1.54 μm emitters based on monolithic integration of Er doped GaN with nitride emitters RAJENDRA DAHAL, CRIS UGOLINI, ASHOK SEDHAIN, JINGYU LIN, HONGXING JIANG, Kansas State University, JOHN ZAVADA, US Army Research Office, North Carolina — Er doped III-nitride semiconductors have emerged as very promising materials for applications in photonic devices due to their novel optical and physical properties. Optoelectronic and photonic devices based on Er doped GaN are expected to meet the demand for next generation telecommunication devices due to efficient and temperature stable 1.54 μm emission from Er doped GaN. We report here on the successful fabrication of a chip size current injected 1.54 μm emitters by monolithic integration of Er doped GaN epilayers with 365 nm nitride light-emitting diodes (LEDs). Er doped GaN and $In_{0.06}Ga_{0.94}N$ epilayers were grown on sapphire substrates by metal organic chemical vapor deposition (MOCVD). The photoluminescence excitation (PLE) and absorption spectra of these epilayrs were investigated to understand the 1.54 μm emission mechanism. A strong correlation between PLE and absorption spectra near the energy bandgap of host nitride epilayers suggest that band to band absorption and subsequent energy transfer to Er ion for 1.54 μm emission is a much more effective excitation mechanism compared to the direct absorption by Er ion. The success opens the possibility for next generation IR integrated photonic devices such as emitters, detectors, and optical amplifiers.

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