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Enhanced 1.53 μm emission from Er/Yb fluorophosphate glasses for optical amplifiers

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Statement of the Problem: Erbium Doped Fiber Amplifiers (EDFAs) have been studied extensively to convert the NIR radiation into the visible light. The EDFAs can be applied in numerous optical applications like; optical fiber communication, data storage, biomedical diagnostic, color display, sensor,eye-safe laser and undersea optical communication. The host glass matrix noticeably affects the emission properties of the rare earth ions and, therefore, a broad study is obligatory for the exploration of the paramount apt host matrix. Fluorophosphate (FP) provides an excellent way to obtain the best matrix for doping of rare earths. The FP matrixes endure fracture toughness effortlessly making stable solid state lasers over extensive physical qualities. These matrixes are perfect for large inhomogeneous augmentation, superior broadband and flatness due to low phonon energy.Methodology & Theoretical Orientation:In this study, we report preparation of Er^{3+}/Yb^{3+} co-doped Fluorophosphate (FP) glasses containing aluminium-metaphosphate by melt quenching technique. The UV-Vis-NIR absorption measurements were carried out and analyzed through Judd–Ofelt model. Various spectroscopic properties like radiative lifetime, transition probability, intensity parameters Ωλ, emission cross-sections and stimulated absorption cross-sections at 1.53 μm have been evaluated.Findings: In this study, we report preparation of Er^{3+}/Yb^{3+} co-doped Fluorophosphate (FP) glasses containing aluminium-metaphosphate by melt quenching technique. The UV-Vis-NIR absorption measurements were carried out and analyzed through Judd–Ofelt model. Various spectroscopic properties like radiative lifetime, transition probability, intensity parameters Ωλ, emission cross-sections and stimulated absorption cross-sections at 1.53 μm have been evaluated.The fluorescence lifetime was measured and calculated by non-exponential least square fit technique. The lifetime of the glasses first increased and then decreased with increased Yb^{3+} mol%. Conclusion & Significance: Near infrared absorption and absorption cross-section were increased withan increase in YbF_3content. Emission elucidations showed that the glass matrix and concentration of $Er^{3+}$and Yb^{3+}ions significantly impact the emission characteristics and radiative lifetimes. The longest lifetime of 12 ms proved the better host matrix and 2 mol% YbF_3 is the best condition for Er co-doped glasses.

Biography

Ganesh Agawane obtained his PhD in 2015 from Chonnam National University, Gwangju, S. Korea. His PhD thesis title is Fabrication of CZTS thin film solar cells by sol-gel spin-coating and PLD method. Presently he is working as a post–doctoral researcher at Korea Photonics Technology Institute (KOPTI), Korea. His present research interest includes preparation of Er3+ doped Yb3+ sensitized fluorophosphate glasses for 1.53 um LiDAR applications.

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