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Spectroscopic properties of magnesium metaphosphate based fluorophosphate glasses co-doped with Er/Yb

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Statement of the Problem: In recent years, a high-speed data transmission demand has been increased tremendously due to the internet traffic. Although Erbium Doped Fiber Amplifier (EDFA) is a mature technology and is the workhorse for Wavelength Division Multiplexing (WDM) and all optical networks, its relatively large size requires further research and development to achieve the ever-wanted small, compact, and efficient fiber amplifiers. Among different host matrices, Fluorophosphate (FP) glasses have been received great attention for optical amplifier applications because of their promising properties such high rare earth solubility, good thermal and chemical stability, and so on. In particular, Er3+/Yb3+ co-doped FP glasses can enlarge the emission cross-section and improve luminous efficiency than the trivalent erbium (Er3+)-doped FP glass materials, because Yb3+ has significantly higher absorption cross-section at around 980 nm than Er3+ [3-5]. Hence, the present study reports the spectroscopic properties of co-doped FP glasses with varying Yb3+ concentration.

Methodology: Er3+/Yb3+ co-doped magnesium metaphosphate based fluorophosphate glasses were prepared by a conventional melt quenching technique and they were characterized through spectroscopic techniques.

Findings: From spectral measurements, the important spectroscopic properties such as emission cross-sections and lifetime have been evaluated for the emission band at 1.53μm in order to the see the potentiality of the material as gain media. It was found that the larger emission cross-section of the order of 2.38 x 10-20 cm^2 and longer lifetime of the order of 16 ms have been obtained for 1.53μm emission band.

Conclusion & Significance: It was demonstrated that larger concentration of Yb ions improves the signal emitted, partly because it helps in reducing quenching of Er and partly because energy transfer was enhanced. The optimum Er/Yb ratio was found to be 3:4. The results indicate that this glass composition has strong possibilities of being used in lasers and amplifiers.

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