Structural, thermal and spectroscopic properties of Er_2O_3doped oxyfluro tellurophosphate glasses

B. Kiran Kumar[1,2], P.Reddi Babu[1],Vigilio de Carvlho dos Anjos[3], Anees A Ansari[4]and B. Deva Prasad Raju[1,*].

[1]Department of Physics, Sri Venkateswara University, Tirupati – 517 502, India.
[2]Department of Physics, Government Degree College, Rayachoty-516 269, India.
[3]Universidade Federal de Juiz de Fora, Campus Universitário, SN - Juiz de Fora - MG Zip: 36036-330.
[4]College of Science, King Saud University, Riyadh-11451, Saudi Arabia.

***Corresponding author:** drdevaprasadraju@gmail.com, Tel.: +91-9440281769.

Abstract:

Oxyfluoro tellurophosphate glasses doped with erbium were fabricated using the conventional melt quench technique. The glass compositions were designed as (60-x) P_2O_5 + 10TeO_2 + 15BaF_2 + 15MgF_2 + xEr_2O_3, where x represents the erbium oxide concentration in mol% (x = 0.1, 0.5, 1, 1.5, 2). Various physical parameters were investigated to assess the properties of the prepared glasses. The non-crystalline nature of the samples was confirmed by analyzing their X-ray diffraction patterns, which indicated the absence of well-defined crystal peaks. Elemental analysis of the glasses was performed using energy-dispersive X-ray spectroscopy (EDAX), revealing the accurate composition of the prepared samples. The thermal stability and rigidity of the glasses were determined through differential scanning Calorimetry (DSC), which demonstrated their significant resistance to thermal changes. Fourier Transform Infrared Spectroscopy (FTIR) was employed to identify the presence of different functional groups within the glass matrices.Absorption spectra analysis revealed the presence of 13 absorption bands.J-O parameters Ω_λ (λ =2, 4, and 6) were determined through the analysis of absorption spectra. Furthermore, radiative properties of the glasses were calculated, and near-infrared (NIR) emission spectra showed that the PTBMEr05 glass exhibited the highest peak intensity for the transition from $^4I_{15/2}$ to $^4I_{13/2}$.Experimental lifetime values were evaluated and compared with those reported for previously studied erbium-doped glass samples.

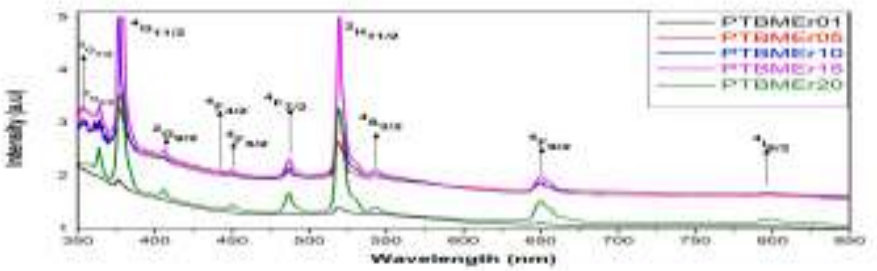

Fig. 1. Optical absorption spectra of prepared glasses.

Acknowledgements

The author (Anees A Ansari) is thankful to the Researchers Supporting Project number (RSP2023R365), King Saud University, Riyadh, Saudi Arabia

Reference:

1.A.A. El-Maaref , E.A. Abdel Wahab , Kh S. Shaaban , R.M. El-Agmy, Enhancement of spectroscopic parameters of Er^{3+} doped cadmium lithium gadolinium silicate glasses as an active medium for lasers and optical amplifiers in the NIR-region, Solid State Sciences 113 (2021) 106539, https://doi.org/10.1016/j.solidstatesciences.2021.106539