World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:10, No:06, 2016

Composition Dependent Spectroscopic Studies of Sm3+-Doped Alkali Fluoro Tungsten Tellurite Glasses

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Abstract : Samarium ions doped Alkali Fluoro Tungsten Tellurite (AFTT) Glasses have been prepared by using the melt quenching technique and characterized through various spectroscopic techniques such as optical absorption, excitation, emission and decay spectral studies. From the measured absorption spectra of Sm3+ ions in AFTT glasses, the optical band gap and Urbach energies have been evaluated. The spectroscopic parameters such as oscillator strengths (f), Judd-Ofelt (J-O) intensity parameters (Ωλ), spontaneous emission probability (AR), branching ratios (βR) and radiative lifetimes (τR) of various excited levels have been determined from the absorption spectrum by using J-O analysis. A strong luminescence in the reddish-orange spectral region has been observed for all the Sm3+ ions doped AFTT glasses. It consisting four emission transitions occurring from the 4G5/2metastable state to the lower lying states 6H5/2, 6H7/2, 6H9/2 and 6H11/2 upon exciting the sample with a 478 nm line of an argon ion laser. The stimulated emission cross-sections (σe) and branching ratios (βmeas) were estimated from the emission spectra for all emission transitions. Correlation of the radiative lifetime with the experimental lifetime measured from the day curves allows us to measure the quantum efficiency of the prepared glasses. In order to know the colour emission of the prepared glasses under near UV excitation, the emission intensities were analyzed using CIE 1931 colour chromaticity diagram. The aforementioned spectral studies carried out on Sm3+ ions doped AFTT glasses allowed us to conclude that, these glasses are best suited for orange-red visible lasers.

Keywords : fluoro tungsten tellurite glasses, judd-ofelt intensity parameters, lifetime, stimulated emission cross-section
Conference Title : ICGST 2016 : International Conference on Glass Science and Technology
Conference Location : New York, United States
Conference Dates : June 06-07, 2016