

Optical and spectroscopic characterization of Er³⁺-Yb³⁺ co-doped tellurite glasses and fibers

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Abstract

Optical and spectroscopic properties of Er³⁺-Yb³⁺ co-doped TeO₂-WO₃-Nb₂O₅-Na₂O-Al₂O₃ glasses and fibers were investigated. Emission spectra and fluorescence lifetimes of ⁴I_{13/2} level of Er³⁺ ion as a function of rare earth concentration and fiber length were measured in glasses. Results show that the self-absorption effect broadens the spectral bandwidth of ⁴I_{13/2} → ⁴I_{15/2} transition and lengthens the lifetime significantly from 3.5 to 4.6 ms. Fibers were fabricated by the rod-in-tube technique using a Heathway drawing tower. The emission power of these Er³⁺-Yb³⁺ co-doped Step Index Tellurite Fibers (SITFs; lengths varying from 2 to 60 cm) were generated by a 980 nm diode laser pump and then the emission power spectra were acquired with an OSA. The maximum emission power spectra, within the 1530-1560 nm region, were observed for fiber lengths ranging from 3 to 6 cm. The highest bandwidth obtained was 108 nm for 8 cm fiber length around 1.53 μm. © 2014 Published by Elsevier B.V.

Author keywords

Broadband emission; Er³⁺ doped tellurite fibers; Er³⁺-Yb³⁺ co-doped tellurite fibers; Er³⁺-Yb³⁺ co-doped tellurite glasses; Optical properties