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SOL-GEL PREPARATION AND SPECTRAL-FLUORESCENT PROPERTIES OF DOPED ERBIUM SBS GLASSES FOR OPTOELECTRONICS

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At present time the optoelectronics is a one of major branches of science and technique. The progress of an optoelectronics is essentially connected with advance of functional material science. Therefore the sol-gel synthesis of SBS glasses, doped Er^{3+}-ions is represented actual direction for investigations.

The sodium-boron-silicate glasses (SBS) doped with Er^{3+}-ions were synthesized by indirect sol-gel method. The procedure involves the following stages: the preparation of initial mixture components (H_2BO_3, $NaNO_3$, aerosil type A-175, ultra-sonic dispergation, gel formation by addition NH_4F solution up to pH~2, aging and drying in air at 60^0C during 2÷3 days. Then the drained gel powder was loaded into corundum crucible and sintered at the temperature 1200^0C for 1÷1.5 hour in the muffle furnace. The salts of doping erbium were introduced at the liquid sol stage and their concentration was composed to 0.3÷0.5 mass %.

We have investigated the spectroscopic properties of obtained materials. There are 10 bands in absorption spectrum of synthesized glasses, corresponding to the electron transitions from ground state $^4I_{15/2}$ to exited states $^4I_{13/2}$, $^4I_{11/2}$, $^4I_{9/2}$, $^4F_{9/2}$, $^4S_{3/2}$, $^2H_{11/2}$, $^4F_{7/2}$, $^4F_{5/2}$, $^2H_{9/2}$, $^4G_{11/2}$ и $^2G_{9/2}$. In the fluorescence spectra at nonselective (xenon lamp + light filter SZS22) excitation the intensive band of resonance $^4I_{13/2}\rightarrow{}^4I_{15/2}$ transition with maximum at λ=1530 nm is observed. It is known that the form of resonance fluorescence band of Er^{3+}-ions is more sensitive to glass composition in contrast to corresponding absorption band. In contrast to silica gel-glasses [1] for SBS glass prepared by considered method the half-width of a line of $^4I_{13/2}\rightarrow{}^4I_{15/2}$ transition increases to 200÷300 cm^{-1}. At first it is connected with increasing of the relative intensity of radiation, caused by a transitions from upper Stark component of $^4I_{13/2}$ therm, responsible for high-frequency part of fluorescence band at 300^0 K.

The sol-gel sodium-boron-silicate glasses doped with erbium are interesting as of medium for planar integral-optical waveguides lasers and amplifiers [2].

References

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