

## OPTICAL SPECTROSCOPY OF Nd<sup>3+</sup> LUMINESCENCE CENTRES IN THE Sr<sub>4</sub>B<sub>14</sub>O<sub>25</sub>:Nd CRYSTAL

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The new borate crystals with Sr<sub>4</sub>B<sub>14</sub>O<sub>25</sub>:Nd (Nd<sub>2</sub>O<sub>3</sub> : SrO = 1 : 100) composition were obtained by Czochralski technique according to technology, described in [1]. By optical and electron paramagnetic resonance (EPR) spectroscopy it was shown, that the Nd impurity is incorporated into the Sr<sub>4</sub>B<sub>14</sub>O<sub>25</sub> structure as Nd<sup>3+</sup> ions.

Optical absorption, emission and luminescence kinetics of Nd<sup>3+</sup> centres in the borate crystal with Sr<sub>4</sub>B<sub>14</sub>O<sub>25</sub>:Nd composition are investigated and analysed in comparison with Nd<sup>3+</sup> optical spectra in the glass with same composition [2] and other borate crystals. Oscillator strengths ( $P_{\text{theor}}$  and  $P_{\text{exp}}$ ) of observed absorption transitions and phenomenological intensity parameters  $\Omega_t$  ( $\Omega_2=1.59 \cdot 10^{-20} \text{ cm}^2$ ,  $\Omega_4 = 2.06 \cdot 10^{-20} \text{ cm}^2$ , and  $\Omega_6 = 2.28 \cdot 10^{-20} \text{ cm}^2$ ) were calculated on the basis of standard Judd-Ofelt theory. Using obtained  $\Omega_t$  parameters, the radiative transitions rates ( $W_r$ ), branching ratios ( $\beta$ ) and radiative lifetime ( $\tau_{\text{rad}}$ ) for emission from the <sup>4</sup>F<sub>3/2</sub> level of Nd<sup>3+</sup> centres in the Sr<sub>4</sub>B<sub>14</sub>O<sub>25</sub> crystal have been calculated. Measured lifetime values ( $\tau_{\text{exp}} = 105$  and  $93 \mu\text{s}$  at  $T = 10$  and  $300 \text{ K}$ , respectively) are compared with those calculated ( $\tau_{\text{rad}} = 331 \mu\text{s}$ ). The quantum efficiency for Nd<sup>3+</sup> centres from <sup>4</sup>F<sub>3/2</sub> emitting level in the Sr<sub>4</sub>B<sub>14</sub>O<sub>25</sub>:Nd crystal is estimated ( $\eta \cong 32 \%$ ).

Incorporation peculiarities and local structure of the Nd<sup>3+</sup> luminescence centres in the Sr<sub>4</sub>B<sub>14</sub>O<sub>25</sub> crystal and corresponding glass with 4SrO-7B<sub>2</sub>O<sub>3</sub> composition are considered on the basis of published X-ray diffraction data [3] and obtained results of optical spectroscopy.

### References

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