

OPTICAL TRANSITION OF TRIVALENT NEODYMIUM (Nd<sup>3+</sup>) IN THE ANISOTROPIC CRYSTAL LITHIUM NIOBATE

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**ABSTRACT**

The absorption spectroscopic analysis of the radiative transitions of Nd-doped LiNbO<sub>3</sub> has been analysed. The line strengths of several transitions from the ground state to the excited state manifolds are evaluated from the measurement of the polarized absorption spectra and are analyzed using the Judd-Ofelt (J-O) theory. The transition-matrix elements for Nd<sup>3+</sup> were calculated by using intermediate coupling coefficient and the results were used to obtain the J-O parameters. It is found that the intensity parameters (J-O parameters) of this crystal  $\Omega_2$ ,  $\Omega_4$  and  $\Omega_6$  are  $2.1 \times 10^{-20}$  cm<sup>-2</sup>,  $5.6 \times 10^{-20}$  cm<sup>-2</sup>, and  $7.1 \times 10^{-20}$  cm<sup>-2</sup> respectively, with the goodness,  $\delta = 0.23 \times 10^{-20}$ . Meanwhile, the spectroscopic quality factor, Q is found to be 0.79. The radiative lifetimes, the branching ratios and the line transition strengths have been calculated and were found to be dependent on the transition level. The radiative quantum efficiency,  $\zeta$  is calculated by using multiphonon relaxation rates and it is found that the lasing transition at 4F<sub>3/2</sub>,  $\zeta$  is around 0.83.

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