

In describing the purely spectroscopic method [1, sect. B] of determining the amplification cross section of Nd^{3+} , the formula

$$\frac{\tau_{21}}{\tau_{20}} = \frac{I_{20}}{I_{21}} \quad (1)$$

was used. τ and I are the radiative lifetimes and integrated fluorescent intensities, respectively. The subscripts 21 and 20 refer to the 1.052 and 0.867 μm emissions, respectively.

Equation (1) relates the intensities and probabilities of transitions that share a common upper level. It is correct only if I is given in numbers of photons. If I is given in joules, watts, or other common intensity (energy) units the correct relationship is expressed by [2]

$$\frac{\tau_{21} \nu_{20}}{\tau_{20} \nu_{21}} = \frac{I_{20}}{I_{21}} \quad (2)$$

where ν is the frequency. The reason is that the radiative lifetimes (reciprocal of the Einstein A coefficients) refer to the rate at which emitters leave an upper level in a given transition; but the energy (intensity) thus emitted depends on which of the lower levels (transitions) is involved.

In the case cited $\nu_{21}/\nu_{20} \approx 0.824$, and it appears to us that this term should have been included in their equation (9). This would reduce their calculated value of τ_{21} from 700 to approximately 577 μs . Since σ_{21} was calculated from

$$\sigma_{21} = \frac{\lambda_0^2}{8\pi n^2} \frac{1}{\Delta\nu} \frac{1}{\tau_{21}} \quad (3)$$

the cross section would be increased from 8.3×10^{-20} to approximately $10 \times 10^{-20} \text{ cm}^2$. (A factor of c was incorrectly shown, but not used, in their equation 10.)

Their comparison of the Nd:glass cross section to the Nd:liquid cross section would not be significantly affected since it appears that a similar omission of the (ν_{21}/ν_{20}) factor was previously made by one of the authors in determining the Nd:glass cross section [3].

A similar type of correction should, we believe, be applied to the expression

$$\tau_t = \tau_{20} \frac{I_{20}}{I_t}, \quad (4)$$

which was used to estimate the quantum efficiency and total radiative decay time (τ_t).

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REFERENCES

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- [2] See for example: H. Samelson, A. Heller, and C. Breder, "Determination of the absorption cross section of the laser transitions of the Nd^{3+} ion in the $\text{Nd}^{3+}:\text{SeOCl}_2$ system," *J. Opt. Soc. Amer.*, vol. 58, pp. 1054-1056, 1968; E. Hinnov and F. W. Hofmann, "Measurement of absolute radiation intensities in the vacuum-ultraviolet region," *ibid.*, vol. 53, pp. 1259-1265, 1963; A. C. G. Mitchell and M. W. Zemansky, *Resonance Radiation and Excited Atoms*. London: Cambridge Univ. Press, 1961, p. 148.
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Correction to "Performance of an Unstable Oscillator on a 30-kW CW Gas Dynamic Laser"

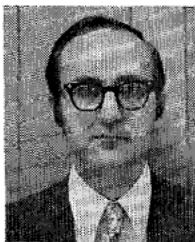
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