pA13

SPECTRAL INTENSITIES AND STIMULATED RADIATION OF A Tm^{3+} DOPED FLUORIDE HOST

K. LABBACI and M. DIAF
Laboratory of Physics of Laser Materials and Optical Spectroscopy (LAPLASO), Department of Physics, Badji Mokhtar University, B.P. 12, 23000 Annaba, Algeria
E-mail : k_labbaci@yahoo.fr

ABSTRACT: In the last few years, the search for new materials emitting in the eye-safe spectral range around 1.55 µm has aroused an increasing interest [1, 2]. In this spectral region, many applications in various domains were carried out: telemetry, dosage of pollutants in the atmosphere, telecommunications, etc. Currently, the fluorides attract much attention as a laser medium due to the fact that they generally present maximum phonon energies weaker than the oxides which make them possible to obtain high fluorescence quantum efficiency by limiting the non-radiative deexcitation probabilities. Moreover, the fluorides are significant host for the optically active trivalent rare earth ions because of the broad splitting of the crystal field and the high cross-sections of transition [3-5]. In this work, the absorption spectra of a $5NaF\text{-}9YF_3$ crystal doped with Tm^{3+} ions are studied. By means of the Judd Ofelt method, we determined the intensity parameters of this host and calculated the radiation transition probabilities, the branching ratios and the radiative lifetimes of Tm^{3+} ions whose knowledge is capital for various laser studies. In comparison with other laser crystals [6,7,8], the calculated parameters show that the Tm^{3+}:$5NaF.9YF_3$ crystal satisfies the fundamental spectral condition for laser emission.

KEYWORDS: fluoride crystals, rare-earth spectroscopy, Judd-Ofelt theory, radiative transition probabilities

References

[1] D. Sliney, M. Wolbarsht, Plenum press, New York (1980) 145
[2] C. Borel, B. Viana, Ann. Chim. Fr 20 (1995) 227
[3] J.M. Brunetaud,. Optique et photonique. **3** (1998) 53
[4] K. Kincade, Laser Focus, Aout: (1995) 34
[5] N.P. Barnes, Laser Focus World, Avril: (1995) 87
[6] A.A. Kaminskii, Crystalline Laser: Physical processes and operating schemes. (CRC Press, Boca Raton), 1996
[7] S.E. Ivanova, A.M. Tkachuk, M.F. Joubert, Y. Guyot, S. Guy, Optics and spectroscopy, **89** (4) (2000) 535-548
[8] M. Diaf, A. Braud, C. Labbe, J.L. Doualan, S. Girard, J. Margerie, R. Moncorge and M. Thuau. Can. J. Phys. **77** (1999) 1-5