Erbium Isotope Shift and Hyperfine Structure Studies Using sub-Doppler Techniques

Patricia Bueno[1]*, Jhonatha R. dos Santos[1], M. Esther Sbampato[1,2], José W. Néri[2], Jonas Jakutis Neto[2], Marcelo G. Destro[1,2]

[1] *Aeronautics Institute of Techonology – ITA, São José dos Campos, Brazil,*
[2] *Institute for Advanced Studies – IEAv, São José dos Campos, Brazil*

*e-mail: patricia.pabn@gmail.com

Erbium has applications covering several areas such as lasers, optical fibers and nuclear industry as neutron-absorber. There are improvements in the final process efficiency of certain applications when isotopes are used instead of natural erbium. An example is the case of specific alloys applied in nuclear technology, whose active component is the ^{167}Er isotope. As mentioned in previous works[1,2], to perform isotope separation via lasers, spectroscopic atom knowledge is required in order to tune correctly the dye lasers. Isotope shift (including the absolute positions) and the hyperfine structure information were obtained performing experiments using two sub-Doppler techniques: intermodulated optogalvanic spectroscopy (IMOGS) and laser-induced fluorescence (LIF). Figure 1 shows a synthetic spectrum of erbium transition at 582.842 nm (0 → 17157.31 cm^{-1}) and also the spectra obtained from IMOGS and LIF by means of a hollow cathode lamp filled with argon as a buffer gas.

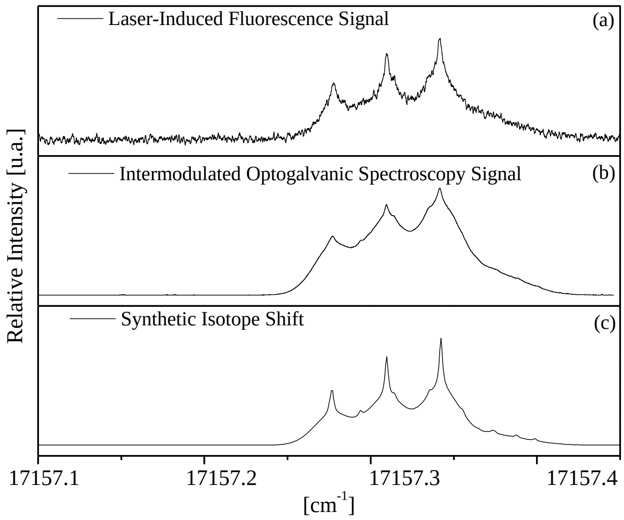

Figure 1: Isotope shift results of the erbium transition at 582.842 nm. (a) Spectrum obtained using the laser-induced fluorescence technique. (b) Intermodulated optogalvnic spectroscopy signal. (c) Synthetic spectrum for isotope shift.

REFERENCES

1. P. Bueno, *et al.* Espectroscopia Optogalvânica de Dois Passos Utilizando Lâmpada de Catodo Oco de Érbio, in **5º Encontro Nacional Sobre Terras Raras**, João Pessoa, PB, 2012.
2. P. Bueno, *et al.* Estudos espectroscópicos de érbio visando à separação isotópica a laser, in **6º Encontro Nacional Sobre Terras Raras**, RECIFE, PE, 2014.

The authors acknowledge the financial support from CAPES - Coordenação de Aperfeiçoamento de Pessoal de Nível Superior and CNPq – Conselho Nacional de Desenvolvimento Científico e Tecnológico.