

## Crystal Growth and Optical and Spectroscopic Characterization of Type III $\text{KYb}_{0.05}\text{Gd}_{0.95}(\text{PO}_3)_4$

*I. Parreu, M.C. Pujol, F. Güell, R. Sole, F. Gavalda, J. Massons, M. Aguiló & F. Diaz*

*Física i Cristal·lografia de Materials (FiCMA). Universitat Rovira i Virgili, Campus*

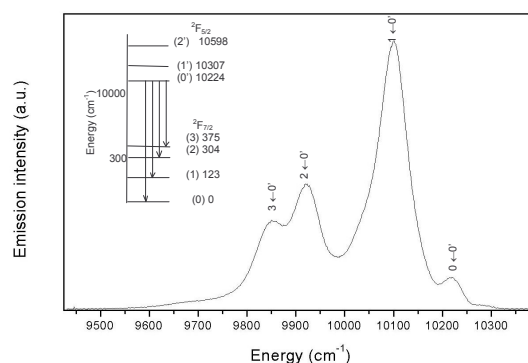
*Sescelades.C/Marcel·lí Domingo, s/n, 43007 Tarragona, Spain.*

[isabel.parreu@urv.net](mailto:isabel.parreu@urv.net)

**Introduction.** Well known are the advantages of the ytterbium ion over the neodymium one as a dopant laser on for diode-pumped solid state lasers in the 1  $\mu\text{m}$  region [1, 2]. Our aim is to obtain and characterize Yb-doped Type-III  $\text{KGd}(\text{PO}_3)_4$  (KGP) [3]. KGP is regarded as a promising self-frequency doubling laser host which could be used to obtain green light by self-frequency doubling allowed by its non-centrosymmetrical structure. Moreover, it expands almost isotropically in front of temperature which prevents it from deforming and it can be easily doped with any other lanthanide ion due to the high capacity of gadolinium to be substituted.

**Obtaining  $\text{KYb}_{0.05}\text{Gd}_{0.95}(\text{PO}_3)_4$  single Crystals.** In order to obtain high-quality single crystals of type-III  $\text{KYb}_{0.05}\text{Gd}_{0.95}(\text{PO}_3)_4$  we first studied its structural stability because, whereas KGP crystallizes into structural type-III  $\text{KGd}(\text{PO}_3)_4$  and type-A  $\text{KGdP}_4\text{O}_{12}$ ,  $\text{KYb}(\text{PO}_3)_4$  crystallizes into type-IV. We grow small single crystals of KGP:Yb and analyzed their structures by X-ray diffraction analysis. We found that the structural type-III can be achieved with Ytterbium concentrations up to 5%, arising this concentration, type-IV crystallized. Using the top-seeded solution growth-slow cooling method we successfully grow single crystals of  $\text{KYb}_{0.05}\text{Gd}_{0.95}(\text{PO}_3)_4$  of a suitable quality and size for later characterizations.

**Optical Absorption, emission and lifetime measurements of Ytterbium.** We studied the polarized optical absorption at room temperature and 6K of the  $^2\text{F}_{7/2} \rightarrow ^2\text{F}_{5/2}$  transition. We also measured the  $^2\text{F}_{5/2}$  lifetime and the fluorescence spectra at room- and low-temperature. The peaks in the measured spectra correspond to the emission from the excited  $^2\text{F}_{5/2}$  manifold to the four sublevels of the ground state manifold  $^2\text{F}_{7/2}$ , as is shown in the figure. We also



### References:

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