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Influence of synthesis parameters on the morphology and properties of luminescent KGd_2F_7 nanomaterials

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Lanthanide fluoride nanoparticles have been recently studied because of their unique luminescent properties, which arise from the electronic structure of the Ln^{3+} ions, their thermostability, biocompatibility, and color tunability, all of which give rise to very different and interesting luminescent applications, such as displays, nanothermometry, bioimaging, biosensing and biotherapy [1,2]. One of the fluorides that has shown to be very promising is the KGd_2F_7 matrix, thou it has not been as well studied as the $KGdF_4$ and $NaGdF_4$ matrices. Especially for nanomaterials, the synthesis parameters is of great importance to properties of the final product. Therefore, this work aims to study the synthesis of the KGd_2F_7 varying its parameters in order to identify the best conditions that lead to the formation of the desired optical product. The synthetic route used is a coprecipitation method modified from what is seen in the literature [3]. This method involves reagents such as oleic acid, octadecene, and oleyloamine at various temperature steps, which are parameters that were varied to find out the optimal route. The characterization of the nanomaterials includes X-ray diffraction for the structural and optical studies (excitation and emission spectra) for the luminescent $KGd_2F_7:Eu^{3+}$ nanomaterials. Our results indicate that the nanoparticles can be formed at lower temperatures and with different solvent combinations from those reported in the literature. Furthermore, we also aim to synthesize several types of doped nanocrystals of the KGd_2F_7 matrix with interesting luminescent properties, including upconversion process.

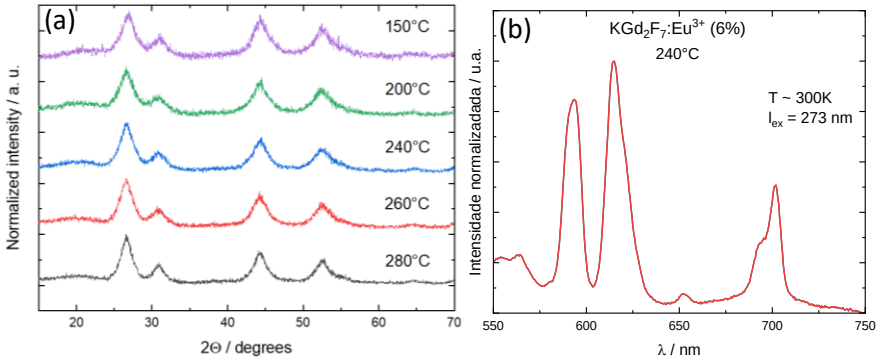

Figure 1 – (a) XRD patterns for the materials prepared at different temperatures and (b) emission spectra of the material synthesized at 240°C, showing the typical Eu^{3+} transitions.

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References

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