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Study of the microwave-assisted synthesis method for the production of luminescent materials $Li_2ZnTi_3O_8:Eu^{3+}$

Raul S. Bueno, Matheus S. N. Saula and Hermi F. Brito

Instituto de Química, Universidade de São Paulo, São Paulo, Brasil
E-mail: Raulb838@usp.br

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Inorganic materials with luminescent properties are applied in various areas, such as bioimaging, photodynamic therapy and LEDs. These luminescent materials generally require long times at high temperatures (~1000 °C) to be synthesized in resistive furnaces, causing high energy costs. In this context, fast and green methodologies, such as the microwave-assisted synthesis method (MASS) have been strongly encouraged. The MASS method allows the rapid formation of materials with high purity and homogeneity due to the direct interaction of electromagnetic radiation with precursor reagents [1,2]. The X-ray diffraction data of the luminescent materials showed the desired crystallographic purity of cubic spinel structure for both methods. This work presents the new photoluminescent materials $Li_{2-x}ZnTi_3O_8:(x)Eu^{3+}$ and $Li_2ZnTi_{3-x}O_8:(x)Eu^{3+}$ named as LZTLi:(x)Eu^{3+} and LZTTi:(x)Eu^{3+} respectively, synthesized by the MASS method and the conventional ceramic method, with the purpose of compare the spectroscopic results obtained.

The materials doped with Eu^{3+} ions presented characteristic thin emission peaks in the red region due to the $^5D_0 \rightarrow {}^7F_J$ intraconfigurational transitions of the europium ion. The materials obtained by the MASS method could be synthesized under low powers (400 W) due to the high conversion of electromagnetic energy into heat of the precursor reactants. The good photoluminescent results together with low powers and synthesis times up to 16 times shorter than those required by the ceramic method make the MASS method a great alternative for the synthesis of ceramic materials with photonic properties in a green and more economical way.

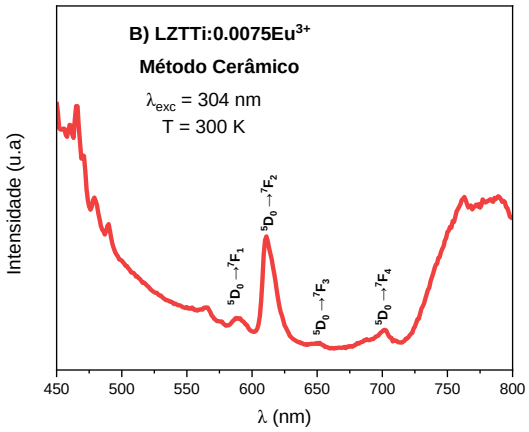

Figure 1 – Emission spectra of LZTTi:0,0075Eu^{3+} material under excitation at 304 nm.

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References

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