Área: INORGÂNICA (INO)
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Europium activator ion acting as an efficient luminescent probe to identify local symmetry in $Li_2ZnSn_3O_8:Eu^{3+}$ materials prepared by the MASS method

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Keyword:Luminescent materials – europium, stannates, microwave-assisted method, anti-counterfeiting probe.

Highlights

Eu^{3+} ion as the luminescent probe was used to investigate the local symmetry of ligand sites in $Li_2ZnSn_3O_8$ host matrix. $Li_2ZnSn_3O_8:Eu^{3+}$materials were synthesized by the domestic microwave oven (MASS method).

Resumo/Abstract

Luminescent materials doped with rare earth ions (RE) have been intensely applied in several areas in the new photonic technologies, such as emergency lights, radiation detectors, biological markers, and anti-counterfeiting products. Stannate-based host matrices have attracted significant attention, as they are relatively inexpensive and have a favorable bandgap to allow the persistence luminescence phenomenon. In this work, $Li_2ZnSn_3O_8:Eu^{3+}$ was synthesized by the microwave-assisted solid-state method (MASS) using a domestic microwave oven after gridding Li_2CO_3, ZnO, SnO_2, Eu_2O_3 precursor oxides. Therefore, the as-prepared precursors were heated in a static air atmosphere at a preset configuration of 900W for 20 min. The material was characterized by powder X-ray diffraction (PXRD), scan electron microscopy (SEM), and diffused reflectance spectroscopy. The PXRD patterns indicate the formation of the desired $Li_2ZnSn_3O_8$matrix phase when doped with different concentrations of the Eu^{3+} ion, showing a high crystallinity. The photoluminescence properties were determined based on the emission spectra of the $Li_2ZnSn_3O_8$:mol%Eu^{3+} materials (**Fig 1**), showing intense yellowish-orange and reddish-orange emission colors under UV excitation at 282 and 336 nm, respectively. Moreover, both spectra show narrow emission bands characteristic of $^5D_0 \rightarrow {}^7F_{0\text{-}4}$ Eu^{3+} transitions. Sinceeuropium ions are powerful spectroscopic probes for the symmetry of the first coordination sphere of these ions in a lattice, and the spectral profiles change with the incident radiation wavelengths, which demonstrates the presence of more than one site of symmetry around the chemical environment of the Eu^{3+}ion.Finally, it is noteworthy that these luminescent materials can be selectively excited in the UV range, leading to more than one specific emission spectral profile, which can be applied as efficient luminescent probes for anti-counterfeiting products.

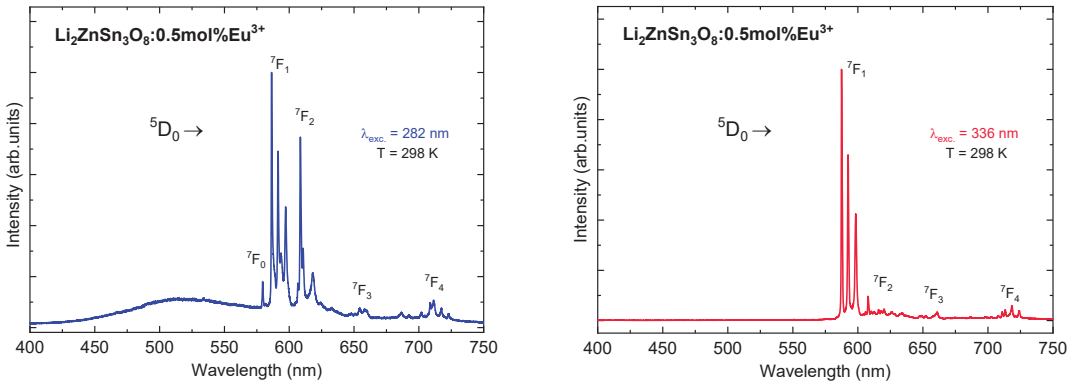

Fig. 1 – Emission spectra of $Li_2ZnSn_3O_8$:0.5mol%Eu^{3+}luminescent material prepared by MASS method under UV excitations at 282 (left) and 336 nm (right).

Agradecimentos/Acknowledgments

The authors are thankful to FAPESP (M.S.N. Saula for the Ph.D. scholarship Grant - 2020/10228-2) and to CNPq for the research grants (306951/2018-5).