

## Synthesis and Characterization of SrWO<sub>4</sub>:Eu<sup>3+</sup> by Microwave-Hydrothermal (MH)

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**Abstract** – SrWO<sub>4</sub> powders were synthesized by the co-precipitation method and processed in a microwave-hydrothermal (MH) at 140 °C for 2 hours. The obtained powders were analyzed by X-ray diffraction (XRD), Raman and photoluminescence spectroscopy. XRD showed crystalline phase characteristic of SrWO<sub>4</sub> (Scheelite). In the Raman spectrum it was observed the characteristic Raman-active vibrational modes of the SrWO<sub>4</sub> matrix. The photoluminescence study revealed a high intensity of the Eu<sup>3+</sup> emission, which <sup>5</sup>D<sub>0</sub> – <sup>7</sup>F<sub>2</sub> transition is the most intense, giving the characteristic Eu<sup>3+</sup> red emission.

SrWO<sub>4</sub> with a scheelite structure is an important luminescent material attracting a lot of interest due to its potential technological applications<sup>[1-3]</sup>. Besides an intrinsic strong blue emission band, these crystals can be used as host lattice for optically active rare-earth ions (Nd<sup>3+</sup>, Er<sup>3+</sup> or Tm<sup>3+</sup>). Therefore, SrWO<sub>4</sub> and CaWO<sub>4</sub> have been proposed as laser materials. The Eu<sup>3+</sup> ion has such particular properties that are considered the choice to act as a probe to investigate its local structure in condensed matter<sup>[2]</sup>. A variety of preparation techniques have been proposed to produce these materials, such as solid state reaction, hydrothermal, sputtering and sol-gel. The methods assisted by microwave radiation have received special attention due to its advantages in the formation of materials with different morphologies and high degree of crystallinity. Therefore, in this paper, SrWO<sub>4</sub>:Eu<sup>3+</sup> powders were synthesized by microwave-hydrothermal (MH) at 140 °C for 2 h. Tungsten and strontium chloride (respectively, WCl<sub>6</sub> and SrCl<sub>2</sub>) were dissolved in HCl and NH<sub>4</sub>OH for complete dissolution. Then EuCl<sub>3</sub> (1,0%) in relation the Sr was added. This solution remained in stirring at 70°C for some hours. After co-precipitation reaction, the solution was transferred into a Teflon autoclave, which was sealed and maintained at 140 °C for 2 h in a MH. Finally, the white precipitates were collected, water washed and dried in a conventional furnace at 75 °C. The powder was characterized by powder X-ray diffraction (XRD), Raman and photoluminescence spectroscopies. Through the XRD (Figure 1) the SrWO<sub>4</sub>:Eu<sup>3+</sup> (scheelite) phase was identified by its reference peaks. In the Raman spectrum it was observed the characteristic Raman-active vibrational modes of the SrWO<sub>4</sub> matrix. The emission spectrum (Figure 2) presents the Eu<sup>3+</sup> <sup>5</sup>D<sub>0</sub> → <sup>7</sup>F<sub>J</sub> (J= 0,1,2,3,4) transitions at, respectively, 580, 591, 614, 651, and 695 nm, under the excitation of 396 nm, which <sup>5</sup>D<sub>0</sub> → <sup>7</sup>F<sub>2</sub> transition is the most intense, giving the characteristic Eu<sup>3+</sup> red emission. The excitation spectrum (Insert of Figure 2) revealed the sharp Eu<sup>3+</sup> lines, which <sup>7</sup>F<sub>0</sub> → <sup>5</sup>L<sub>6</sub> transition at 394 nm is the most intense band.

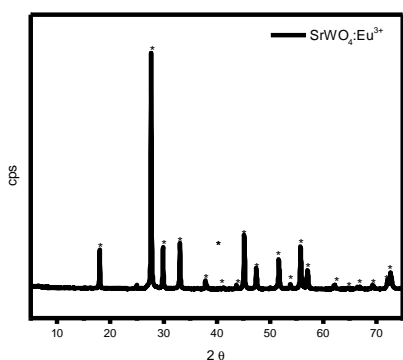


Figure 1: XRD of SrWO<sub>4</sub>:Eu<sup>3+</sup> powder.

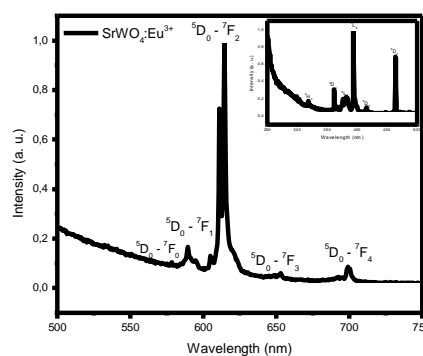


Figure 2: Emission and excitation (insert) spectra of SrWO<sub>4</sub>:Eu<sup>3+</sup>, λ<sub>exc</sub> = 394, λ<sub>em</sub> = 614 nm, respectively.

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