

Sr₂MgSi₂O₇:Eu²⁺, Dy³⁺ long persistent luminescent material synthesized by microwave assisted method

Leonnam G. Merízio^{1*}, Ivan G. N. Silva¹; Lucas C. V. Rodrigues¹, Hermi F. Brito¹

¹Chemistry Institute, University of São Paulo, São Paulo-SP, Brazil

*e-mail: imerizio@iq.usp.br

Persistent luminescent materials can emit light for several hours after ceasing an irradiation source. Studies involving these materials have increased in last years mainly due to their singular properties providing large range of applications¹. Dissilicates (Sr₂MgSi₂O₇) present promising results, however the ordinary processes require high annealing temperatures and time (~1200 °C, 5h). A current challenge is find alternatives synthesis methods that can reduce these elevated time and temperatures required. Microwave assisted method (MW) is an excellent alternative that can achieve high temperatures in only a few minutes allowing synthesis times around 25 minutes. In this work, Sr₂MgSi₂O₇:Eu²⁺,Dy³⁺ was synthesized by solid state MW. The SrCO₃, MgCO₃, SiO₂, and R₂O₃, (R: Eu, Dy) precursors were grinded and annealed in a domestic microwave using carbon as susceptor at 1000 W for 10 minutes and 900W for 15 minutes. The XPD patterns indicate the formation of the desired Sr₂MgSi₂O₇ tetragonal phase with no impurities. The excitation spectrum (Fig.1 left red) shows a broad band from 250 to 450 nm assigned to the Eu²⁺ 4f⁷ → 4f⁶5d¹ transitions. Several Eu³⁺ 4f-4f absorption peaks are observed at *e.g.* 396, 420 and 450 nm. The emission spectra (Fig. 1, left blue) shows a broad band centered at 470 nm arising from Eu²⁺ parity allowed 4f⁶5d¹ → 4f⁷ transition with no Eu³⁺ emission, which indicates energy transfer from Eu³⁺ to Eu²⁺. The CIE chromaticity diagram (Fig. 1 right) shows a blue color agreeing to the emission spectrum. An important characteristic of this material is the possibility to excite efficiently in the visible range (blue region), allowing applications in the storage of sun light energy.

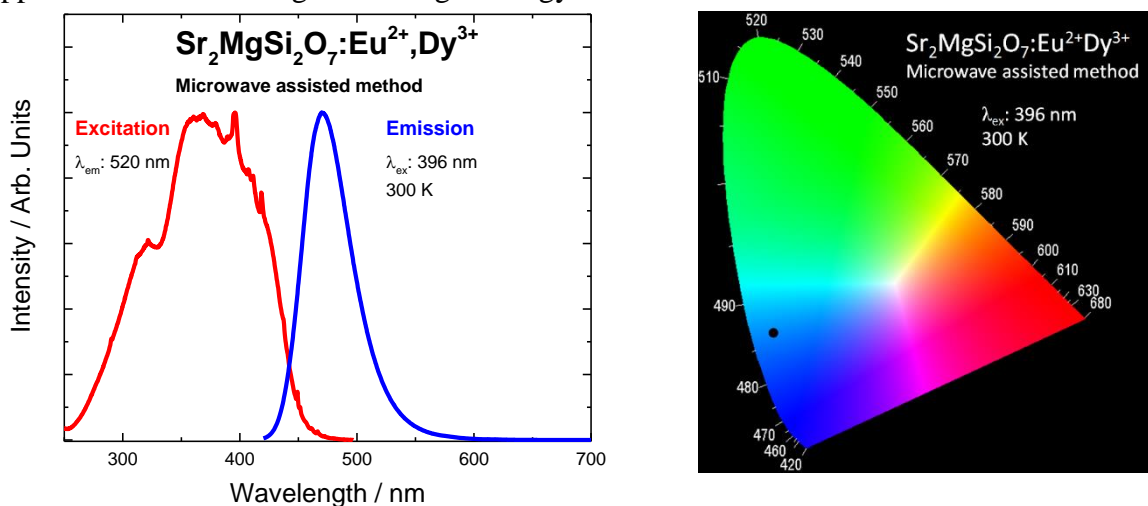


Fig. 1 – Excitation (left, red), emission (left, blue) spectra and CIE coordinates diagram (right) of Sr₂MgSi₂O₇:Eu²⁺,Dy³⁺ materials prepared by microwave assisted method.

1. Brito, H. F.; Hölsä, J.; Laamanen, T.; Lastusaari, M.; Malkamäki, M.; Rodrigues, L. C. V.; *Opt. Mater. Express* **2012**, 2, 371.