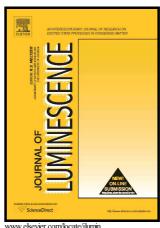
### Author's Accepted Manuscript

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#### **ACCEPTED MANUSCRIPT**

# Energy transfer between terbium and europium ions in barium orthosilicate phosphors obtained from sol-gel route

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#### **Abstract**

The present paper reports on the energy transfer mechanism between Eu<sup>3+</sup> and Tb<sup>3+</sup> in barium orthosilicate obtained from the sol-gel route, when both activators concentration is varied. The synthetic methodology was adjusted to provide high crystalline and monophasic Ba<sub>2</sub>SiO<sub>4</sub>. In the emission spectra under 250 nm excitation, both Eu<sup>3+</sup>  $(^5D_0 \rightarrow ^7F_J)$  and  $Tb^{3+}$   $(^5D_3 \rightarrow ^7F_J$  and  $^5D_4 \rightarrow ^7F_J)$  transitions can be observed at low Eu<sup>3+</sup> doping concentrations with an unexpected and intense blue emission from Tb<sup>3+</sup>. However, when the Eu<sup>3+</sup> content is higher than that of the Tb<sup>3+</sup>, just the Eu<sup>3+</sup> emission is noticed. Also, it is possible to tune the phosphor emission from red to pink by varying the Eu<sup>3+</sup> and Tb<sup>3+</sup> content. From the excitation spectra, we inferred that energy transfer (ET) from Tb<sup>3+</sup> to Eu<sup>3+</sup> occurs at any doping situation, nonetheless, the opposite process happens just when both activators amount is similar. An approach using the Tb<sup>3+</sup> and Eu<sup>3+</sup> lifetimes and the Eu<sup>3+</sup> quantum efficiency confirms this observation, indicating that not only the matrix act as sensitizer to the Eu<sup>3+</sup> ions, but also Tb<sup>3+</sup> ions contribute by increasing the Eu<sup>3+</sup> quantum efficiency in up to 20 %. Finally, by using the Van Uitert theory, it was found for this system that the ET between the two rare-earth ions is dominated by the dipole-dipole mechanism.

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