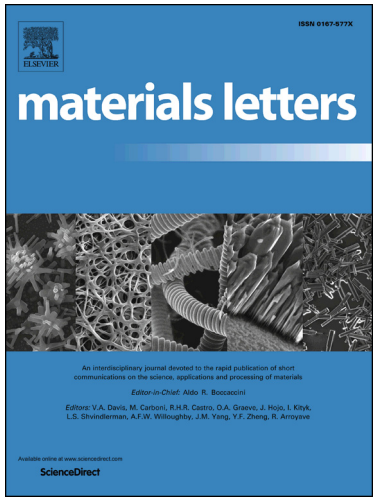

Tb^{3+}/Eu^{3+} co-doped silica xerogels prepared via low-temperature sol-gel method and their luminescence properties

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Tb^{3+}/Eu^{3+} co-doped silica xerogels prepared via low-temperature sol-gel method and their luminescence properties

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Abstract

Silica xerogels doubly-doped with Eu^{3+} and Tb^{3+} ions were prepared via low-temperature sol-gel method. The structural properties were determined based on X-ray diffraction analysis. The optical properties were studied based on excitation and emission spectra as well as luminescence decay analysis and the $Tb^{3+}\rightarrow Eu^{3+}$ energy transfer was registered. Upon direct excitation of Tb^{3+} the characteristic transitions from the $^5D_4$ state of Tb^{3+} and from the $^5D_0$ state of Eu^{3+} were registered. This is direct proof that energy transfer from Tb^{3+} to Eu^{3+} in silica xerogels was occurs. Furthermore, the luminescence decay analysis from the $^5D_0$ excited states of Eu^{3+} upon excitation of Tb^{3+} at λ_{exc}=351nm wavelength were also carried out. The luminescence lifetime from the $^5D_0$ state of Eu^{3+} after excitation at 351nm is long-lived in comparison to excitation at 393nm and increased by 24%.

Keywords: $Tb^{3+}\rightarrow Eu^{3+}$ energy transfer, silica xerogels, sol-gel method

1. Introduction

Energy transfer process is a promising strategy to improve the emission efficiency of wide range of phosphors doped with optically active ions. In such process, the excitation energy could be transferred from the excited state of sensitizer (donor) to a nearby unexcited activator (acceptor). Indeed, energy transfer phenomenon is considered as an interesting topic for many scientists and is focused great attention because it could play an important role in many scientific areas [1-6]. One of the most promising areas for utilize an energy transfer between rare earths is producing multi-color or white-emitting phosphors [4]. It is