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STUDIES ON THE PHOTOLUMINESCENCE OF LUTETIUM OXIDE AEROGELS DOPED WITH EU3+

Compounds synthesized from lanthanide elements have become indispensable due to their high efficiency in applications where their luminescent properties are taken advantage of. Among these can be found phosphors for illumination in screens or night vision, inks for security labels, lasers, photocatalysis, bioprobes, nanoscopy or in light-activated drug delivery. In the present work, through the sol-gel process, gels with different proportions of Eu3+ (0, 2, 5, 8 and 10 mol%) were synthesized in Lu2O3 host matrices, as well as an Eu2O3 matrix for comparative purposes. In the production of aerogels, the gels were dried with supercritical CO2 and subsequently subjected to a thermal treatment at 800 ℃ to induce crystallinity. The products were analyzed by infrared spectroscopy (IR), x-ray diffraction (XRD), scanning electron microscopy (SEM) with energy dispersive spectroscopy (EDS), transmission electron microscopy (TEM) and photoluminescence analysis. According to the results, it is indicated that the main absorption band (M-O-M), which is characteristic of the metal oxide compounds, is located around 560 cm-1 and did not present significant changes as the concentrations of the Eu3+ ion alter the composition of the aerogels. Furthermore, these materials are made up of type-C crystalline structures with crystallite sizes around 10 nm which, in turn, form three-dimensional networks of interconnected particles. Likewise, according to the luminescence studies, the emission bands around 580, 590, 612 and 650 nm were present due to the energy transitions 5D0⟶7F0, 5D0⟶7F1, 5D0⟶7F2 and 5D0⟶7F3 of the Eu3+ ions, respectively. The 10 mol% sample was the one that presented the best results in terms of intensity and quantum yield. In addition, the position of the color in the CIE diagram was calculated, establishing that the color emitted by the aerogels is orange-red. This type of materials has a high potential to be used in biomedical as drug carriers or biomarkers.

Keywords

Rare earths, Sol-gel, Supercritical drying, Aerogels, Luminescence

Reference

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