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EFFECTS OF EUROPIUM CONTENT ON STRUCTURAL, AND LUMINESCENCE, CHEMICAL PROPERTIES OF YPO4 POWDERS OBTAIN BY HYDROTHERMAL METHOD

In this project, europium-doped yttrium phosphate powders (YPO4:Eu3+) with a concentration of 6 mol% were synthesized by the hydrothermal method. The hydrothermal reaction conditions were 190 ℃ for 3 hours. Heat treatment was carried out at 750 ℃ for 3 hours to form the crystal structure. The addition of glycerol as a cosolvent was to prevent agglomeration and promote dispersion of the particles. The pH was adjusted from an acidic medium (pH = 4) to a neutral medium (pH = 7), with the dropwise addition of sodium hydroxide. The powders obtained were characterized by X-ray diffraction (XRD), infrared spectroscopy (IR) and photoluminescence (PL), to study the structural, chemical, morphological, and luminescent properties with respect to the Eu3+ present in the YPO4 structure. The XRD results revealed the formation of the cubic phase without phase transformations 1or secondary phases. The lattice parameters were changed when YPO4 was doped with Eu3+, because the ionic radius of Eu3+ is larger than that of Y3+. Therefore, it is verified that Eu3+ was included in the YPO4 matrix. Using infrared spectroscopy, the bands attributed to the europium-doped yttrium phosphate were obtained, that is, the P-O and the O P-O at 1000, 642 and 618 cm-1 respectively. Photoluminescence analyzes showed the emission and excitation bands at 594 nm and 230 nm, respectively. The energy transitions of europium 3+ were observed: 5D0-7F1, 5D0-7F2, 5D0-7F3, 5D0-7F4 at 600 nm, 630 nm, 650 nm, and 700 nm, respectively. On the other hand, the chromatic coordinates were orange red, which agrees with the ultraviolet-excited Eu3+ emission. On the other hand, the quantum yield of Eu3+-doped YPO4 powders was 62.32%.

Keywords

Phosphors, Rare-earths, Europium, Luminescence, Hydrothermal.

Reference

J. Wu, C. Liu, H. Jia, Y. Qi, Optical properties, energy transfer and thermal stability of spherical nano-phosphor YPO4:Eu3+:Sm3+, College of Materials and Metallurgy, Inner Mongolia University of Sciences and Technology (2022) 22-2313. https://doi.org/10.1016/j.jlumin.2022.118791.

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Author approval

I confirm

Author will attend

I confirm

Primary author: Ms GONZÁLEZ GARCÍA, María del Rosario (Instituto Politécnico Nacional, Centro de Investigación e Innovación Tecnológica)

Co-authors: Dr GARCÍA MURILLO, Antonieta (Instituto Politécnico Nacional, Centro de Investigación e Innovación Tecnológica); Dr CARRILLO ROMO, Felipe de Jesús (Instituto Politécnico Nacional, Centro de Investigación e Innovación Tecnológica)

Presenter: Ms GONZÁLEZ GARCÍA, María del Rosario (Instituto Politécnico Nacional, Centro de Investigación e Innovación Tecnológica)

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