

**INVESTIGATION OF LUMINESCENT PROPERTIES
OF NANOPARTICLES (La, Gd, Y)PO₄:Eu³⁺***Zhidomorova K.A.*^(1,2), *Enikeeva M.O.*^(2,3)⁽¹⁾ St. Petersburg State Institute of Technology
190013, Saint Petersburg, Moskovsky ave., 26⁽²⁾ Branch of the National Research Center "Kurchatov Institute" – PNPI-ICHS
199034, Saint Petersburg, Tiflisskaya st., 3/6⁽³⁾ Ioffe Institute
194021, Saint Petersburg, Politekhnikeskaya st., 26

It is known that the luminescent properties of phosphor nanoparticles depend on the crystal structure, morphology, and particle dimensions of the matrix into which the phosphor ion is incorporated [1]. In addition, the concentration of the alloying agent and the symmetry around the luminescent ion are strongly influenced. In this context, REE orthophosphates (*REEPO*₄) have garnered significant interest among researchers due to their electron configuration and several properties, including the capacity for isomorphic substitution of other REE, low toxicity, elevated refractive index, superior quantum yield of luminescence and high chemical and thermal resistance [2]. An important aspect of obtaining nanomaterials based on *REEPO*₄ is the potential to form various crystalline phases (matrices) with rhabdophane, monazite and xenotime structures using "soft chemical" methods. This allows for the purposeful synthesis of nanoparticles with different structures, compositions, shapes, and properties. Therefore, this research to investigate the relationship between the chemical composition of phosphors, the structural and morphological characteristics of nanoparticles composed of multicomponent REE orthophosphates with Eu³⁺ doping ions, and the luminescent properties of the material.

Nanoparticles with the structures of rhabdophane, monazite and xenotime based on the LaPO₄–GdPO₄–YPO₄–(H₂O) quasi-ternary system with the addition of Eu³⁺ ions, have been synthesized. The molar fraction of Eu³⁺, which is a part of the (La, Gd, Y)PO₄ matrix, varied over a wide range, depending on the crystalline structure of the matrix. The samples were prepared by precipitation, followed by hydrothermal treatment (*T* = 230 °C, *P* ≈ 10 MPa, pH ≈ 1). The synthesis time ranged from 2 hours to 5 days, depending on the luminoform composition.

Based on the findings of the research, emission bands that are characteristic of the Eu³⁺ ion were observed in all luminescence emission spectra. These emission bands correspond to intra-configuration *f-f* transitions from ⁵D₀ → ⁷F_J levels.

1. Zou J., Zhu Q., Li X. J. *Alloys Compd.*, 2021, 870, 159380.

2. Achary, S.N, Bevara S., Tyagi A.K. *Coord. Chem. Rev.*, 2017, 340, 266.

The work was carried out with the financial support of the Russian Science Foundation project 24-13-00445.