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Features of morphology and acid-base properties of the surface, and luminescent characteristics of synthesized phosphors YPO_4:Eu, YVO_4:Eu, $YVPO_4$:Eu

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The compounds of rare-earth elements attract the attention of researchers in connection with their wide practical application. Inorganic materials based on complex oxide compounds are widely used as adsorbents, catalysts, phosphors.

The development of novel synthetic approaches to oxide phosphors with high luminescence efficiency is one of the most important steps towards obtaining various high-tech devices, including plasma panels, auto-electron emission displays, light sources of a new generation, thermoluminescent dosimeters, etc. The application in such devices determines specific requirements to functional properties of the relating luminescent materials, particularly involving a high quantum yield of luminescence and presence of certain absorption and emission bands.

There are a large number of compounds doped with rare-earth ions, the most attractive of which are the oxides of these ions [1-4]. Most of them have thermal stability, as well as good chemical activity. Such compounds include phosphors based on vanadate and yttrium phosphate, activated by europium.

The aim of this research is to synthesis of the phosphors activated by europium namely yttrium vanadate, yttrium phosphate and their combinations as well as determination of the relationship between morphological and acid-base properties of their surface, and luminescent characteristics of this materials.

A series of YPO_4:Eu, YVO_4:Eu and $YVPO_4$:Eu phosphors with different content of Eu(III) activator and with different phosphorus-vanadium ratio for the mixed phosphors are synthesized by the SHS method. It is shown by the SEM method that all the elements, including europium activator, are homogeneously distributed on the particles surface with the dispersion, the porosity, and the value of the specific surface of the phosphors being different [5]. The most finely dispersed samples are YVO_4:Eu and mixed samples. Specific surfaces_of finely mesoporous YPO_4:Eu are 10-15 times higher than vanadate and mixed samples. pH-metry and the indicator method show that the investigated phosphors have a slightly alkaline (YVO_4:Eu, $YVPO_4$:Eu) or slightly acid (YPO_4:Eu) state of the surface with different content of Lewis and Brönsted sites. It is found that the differences in the functional composition, acid-base state of the phosphor surface, along with other factors, cause a difference in the intensity and brightness of the photoluminescence (PL) of the investigated phosphors [6]. The possibility of synthesizing yttrium-phosphate-vanadate phosphors of mixed $YV_xP_{1-x}O_4$:Eu composition with increased brightness and PL intensity compared with phosphate and comparable with vanadate phosphors is demonstrated. Phosphors of mixed composition become more effective in combination with greater availability and lower cost, compared to phosphors based on yttrium vanadate.

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