

LUMINESCENCE OF TUNGSTEN-ACTIVATED CERAMICS BASED ON MAGNESIUM AND BARIUM FLUORIDES

A.V. STRELKOVA¹, A.M. ZHUNUSBEKOV², L.A. LISITSYNA²

¹ *L.N.Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan*

² *FGBOU VO "TGASU", NRU TPU, Tomsk, Russia*

Polyvalent ions are effective activators in materials based on metal fluorides. However, the introduction of such ions into the lattice is a great difficulty. It is especially difficult to introduce multivalent ions, for example, W, U, which cannot be incorporated into the lattice without coactivators. During synthesis, such ions form volatile compounds, which are removed from the reactor. A promising method for obtaining activated materials based on metal fluorides is the radiation synthesis method, in which the formation of a lattice from mixtures occurs predominantly with the participation of highly excited radiolysis products.

We have completed a series of works on the synthesis and study of tungsten-activated materials based on alkaline earth metal fluorides with different lattice structures BaF₂, MgF₂, BaMgF₄. Synthesis was carried out by direct action of an electron beam with an energy of 1.4 MeV and a flux density of 18–23 kW/cm² on a charge of stoichiometric composition with 1 wt% WO₃. The resulting ceramic samples had a structure characteristic of that obtained by traditional methods. The entry of W was controlled by luminescent methods. The excitation and luminescence spectra of ceramic samples synthesized from mixtures were measured. The ceramic samples were crushed mechanically, and the excitation and luminescence spectra of the powders were measured using a CM2203 SOLAR spectrometer. Examples of the results of measurements of the PL of the samples are shown in the figure.

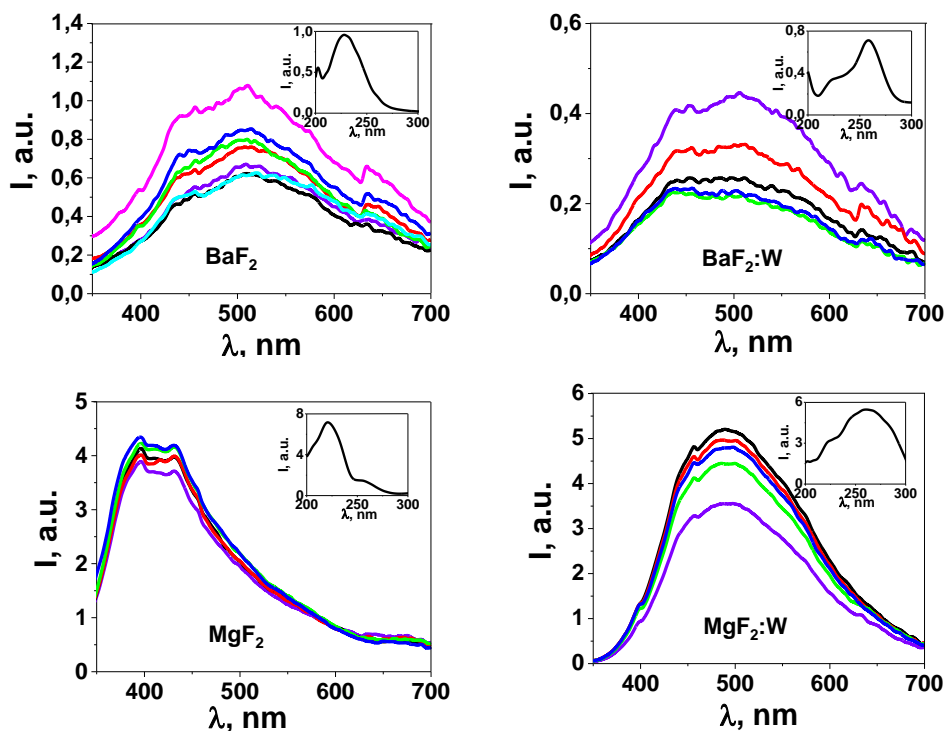


Fig.1. Spectra of luminescence and excitation of samples BaF₂, BaF₂+WO₃, MgF₂, MgF₂+WO₃.

Similar results were also obtained for the Ba_xMg_{2-x}F₄ systems. It can be seen from the obtained results that the excitation spectra of the samples prepared from the mixture containing and not containing tungsten differ. The luminescence spectra also differ. Consequently, tungsten is introduced into the lattice during radiation synthesis in the absence of additional substances in the charge.

The reason for the possibility of introducing W into the lattice is a significantly different set of processes during radiative synthesis from those occurring during thermal synthesis.

REFERENCES

- V.M. Lisitsyn, M.G. Golkovskii, L.A. Lisitsyna, A.K. Dauletbekova, D.A. Musakhanov, V.A. Vaganov, A.T. Tulegenova, Zh.T. Karipbayev, "MgF₂-Based Luminescing Ceramics," Russian Physics Journal, V.61, Issue 10, P. 1908–1913, 2019