Synthesis of phosphors based on strontium aluminates codoped with Ce^{3+} and Mn^{2+} ions

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In the present work, a comprehensive study of the preparative features of the synthesis (solid-phase and colloid-chemical) of luminescent strontium aluminates codoped with Ce^{3+} and Mn^{2+} ions was carried out. The influence of matrix composition ($SrO:Al_2O_3$ = 1:1 and 3:5), heat treatment temperature (900°C, 1300°C and 1500°C), and heating atmosphere (air and H_2+Ar) on the phase composition, morphology, and spectral-luminescent properties of the samples was studied by the XRD, SEM and photoluminescent analysis (emission and excitation).

It was found that the heating temperature has a significant effect on the luminescence intensity of the samples. At a temperature of 900°C, samples do not exhibit luminescence, and with an increase in the heating temperature to 1500°C, the luminescence intensity increases by a factor of 1.5–2, regardless of the matrix composition. Heat treatment in a reducing environment also has a positive effect on the luminescence intensity. It was discovered that during solid-phase synthesis for the samples obtained using $SrCO_3$, blue luminescence is observed, and when using $Sr(NO_3)_2$ – green luminescence, regardless of the matrix composition. Only for the samples obtained by the colloidal – chemical synthesis, heated at 1500 °C, phosphorescence is observed (Fig.).

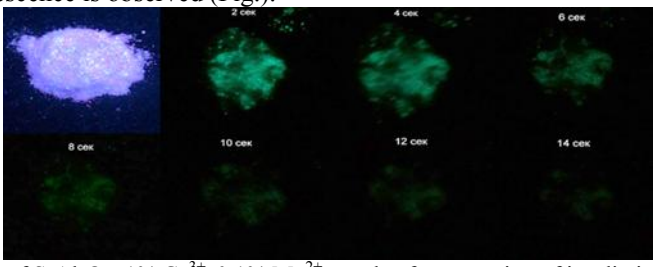

Fig. Photo of $SrAl_2O_4$: 1% Ce^{3+}, 0.1% Mn^{2+} sample after cessation of irradiation with an ultraviolet lamp (λ_{ex} = 312 nm, 10 min) depending on time of irradiation

The reasons for the influence of the studied preparative techniques and synthesis methods on the luminescent properties of the obtained samples will be discussed