

## Crystal growth, optical and scintillation properties of $(\text{La,Gd})_2\text{Si}_2\text{O}_7\text{:Tb}$ crystals

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Cerium-activated gadolinium pyrosilicate-based crystals are among the brightest and fastest oxide scintillators [1,2]. Recently, the scintillation efficiency of gadolinium pyrosilicate upon activation with  $\text{Tb}^{3+}$  has been demonstrated, and the light output of 90,000 photons/MeV was achieved [3]. The production of bulk crystals of gadolinium pyrosilicate is limited by incongruent melting [4], whereas partial replacement of  $\text{Gd}^{3+}$  by larger lanthanide ions this matrix provides congruent melting compositions [5].

This report presents the studies of  $(\text{La,Gd})_2\text{Si}_2\text{O}_7\text{:Tb}$  crystals with different La/Gd ratios grown by the Czochralski method from W crucibles in a reducing CO atmosphere (Fig. 1). The optical and scintillation properties of these materials were comprehensively studied.

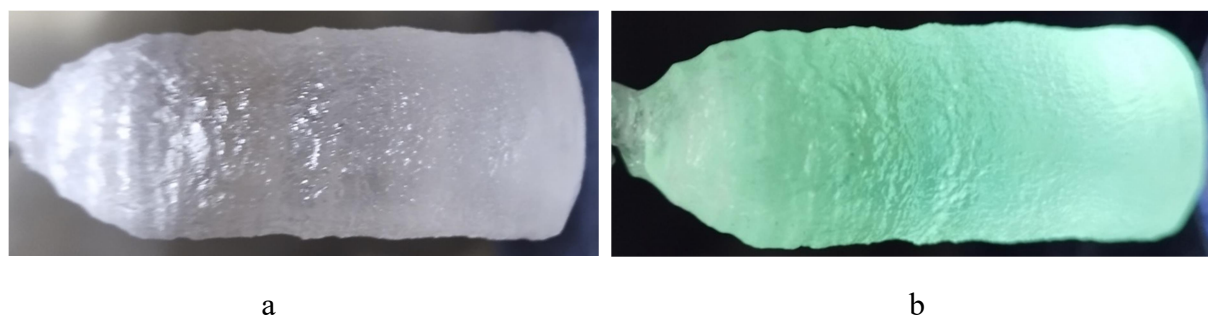


Figure 1 –  $(\text{La,Gd})_2\text{Si}_2\text{O}_7\text{:Tb}$ : a – in daylight, b – under UV irradiation

[1] Gerasymov YaV et al. Impact of codoping on structural, optical and scintillation properties of  $\text{Gd}_2\text{Si}_2\text{O}_7$  – based crystals. *Functional Materials*. 2013;20(1);15-19.

[2] Yoshikawa A et al. Crystal growth and scintillation properties of multi-component oxide single crystals:  $\text{Ce:GAGG}$  and  $\text{Ce:La-GPS}$ . *J Cryst Growth*. 2016;169(B);387-393.

[3] Kantuptim P et al. Optical and scintillation properties of Tb-doped rare-earth pyrosilicate single crystals. *Photonics*. 2022;9(10); 765.

[4] Toropov N et al. *Silicaty redkozemelnyh elementov I ih analogi (Rare-earth silicates and their analogs)*, Nauka, Leningrad, 1971 in Russian.

[5] Suzuki A et al. Fast and high-energy-resolution oxide scintillator: Ce-doped  $(\text{La,Gd})_2\text{Si}_2\text{O}_7$ . *Applied Physics Express*. 2012; 5;102601.