

## Synthesis and photoluminescence of nanocrystalline lutetium pyrosilicate doped with $\text{Ce}^{3+}$ .

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The nanocrystalline  $\text{Lu}_2\text{Si}_2\text{O}_7:\text{Ce}^{3+}$  (LPS:Ce) phosphor was obtained as a result of a solid state reaction at  $1250^\circ\text{C}$  of  $\text{Lu}_2\text{O}_3$  and  $\text{SiO}_2$ . Compared to the monocrystals grown by the Czochralski method (below 0.5%) the procedure of the synthesis allows much higher level of the activator doping (5%). Two samples, one in air (LPS:Ce–O) and the second one in  $\text{N}_2/\text{H}_2$  atmosphere (LPS:Ce–R) were synthesized for comparison. X-ray diffraction analysis confirmed crystallization of a single phase of LPS in the indicated temperature. The UV excited optical luminescence spectrum of LPS:Ce–O at 10K consists of two wide bands centered at 380 and 407nm. The positions of the bands and the decay time of 35ns characteristic for the parity allowed 5d–4f fast emission of the  $\text{Ce}^{3+}$  ion. The overlap between a self-trapped (STE) emission of the host (between 320 and 470nm) and 4f–5d absorption of  $\text{Ce}^{3+}$  (centered at 350nm) allows the energy transfer, which explains the scintillation efficiency of LPS:Ce. Two luminescence mechanisms were detected for the LPS:Ce–R sample. The decay times of 30ns and 200μs cannot have the same origin, as they differ too much. According to the tentative explanation the fast emission is a result of the 5d–4f transition of  $\text{Ce}^{3+}$  and the slow component of the  $\text{Ce}^{4+}$  charge transfer luminescence associated with defects caused by reducing atmosphere.

### Adres publiczny

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