

SYNTHESIS OF MONOPHASIC SrAl₄O₇ COMPOUNDS DOPED WITH EUROPIUM AND DYSPROSIUM AND INVESTIGATION OF LUMINESCENT PROPERTIES

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Strontium aluminate SrAl₄O₇ structure is monoclinic with space group *C2/c* and having cell parameters $a=13.04$, $b=9.01$, $c=5.55$ and $\beta=106.502^\circ$ [1]. According to published scientific literature SrAl₄O₇ is the least researched phase compared to other strontium aluminates which is why it draws much attention nowadays. Its crystallization is sensitive to heating rate due to low kinetics of formation. Koen Van Eeckhout in his review article noted that method of synthesis is very important since crystal structure and luminescence properties of the same compound synthesized by different methods may vary. For example when synthesizing CaAl₂O₄ by sol-gel method one group got a hexagonal structure and the other group ended up with orthorhombic when monoclinic structure was expected [2].

The goal of this study was to synthesize pure phase SrAl₄O₇ via solid state reaction doped with Eu²⁺ and codoped with Dy³⁺ to get a persistent luminescence phosphor. The resulting powder materials crystal structure was analyzed with XRD. Luminescence measurements were carried out using a spectrophotometer to determine emission and excitation spectrum and to record the afterglow of the phosphor. It was noted that luminescence properties vastly vary with different dopant and codopant concentrations added and big dopant concentration may affect the crystal structure. Moreover different dopant concentrations may improve or worsen certain luminescence properties, for example high dysprosium content increases emission intensity but lowers the afterglow duration and on the other hand lower dysprosium content lowers emission intensity but increases afterglow duration, which is why it is important to investigate the optimal conditions to get a desired persistent phosphor with long afterglow and good emission intensity.

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References

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