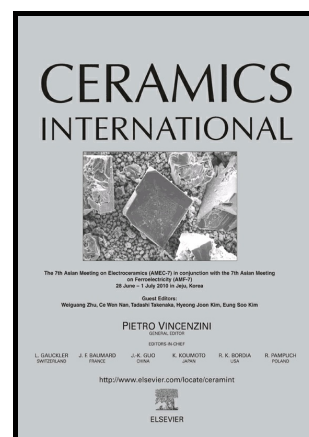


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www.elsevier.com/locate/ceri

PII: S0272-8842(16)32390-2
DOI: <http://dx.doi.org/10.1016/j.ceramint.2016.12.123>
Reference: CER114433

To appear in: *Ceramics International*

Received date: 2 November 2016
Revised date: 20 December 2016
Accepted date: 23 December 2016

Cite this article as: Soo Hyun Lee, Peng Du, L. Krishna Bharat and Jae Su Yu
Ultraviolet radiation excited strong red-emitting $\text{LaAlO}_3:\text{Eu}^{3+}$ nanophosphors
Synthesis and luminescent properties, *Ceramics International*,
<http://dx.doi.org/10.1016/j.ceramint.2016.12.123>

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Ultraviolet radiation excited strong red-emitting $\text{LaAlO}_3:\text{Eu}^{3+}$ nanophosphors: Synthesis and luminescent properties

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Abstract

We synthesized the trivalent europium ions (Eu^{3+}) doped lanthanum aluminate (LaAlO_3 , LAO) nanophosphors by a solvothermal method. Their structural, morphological, and luminescent properties were systematically investigated. The obtained nanoparticles possessed single nanocrystallinity with a rhombohedral structure. For the excitation originating from the charge transfer band (O^{2-} to Eu^{3+} ions) under 320 nm illumination, the featured emissions of Eu^{3+} ions were detected in all the compounds. The optimum doping concentration of Eu^{3+} ions in LAO was about 9 mol% and the concentration quenching was dominated by dipole-dipole interaction. Furthermore, the Judd-Ofelt (J-O) theory was used to estimate the J-O intensity parameters. Based on the temperature-dependent PL emission spectra, the thermal stability was analyzed and the activation energy was obtained to be 0.234 eV. Meanwhile, the decay time, color coordinate/purity, and cathodoluminescence behaviors of synthesized nanophosphors were also studied. These characteristics make the Eu^{3+} doped LAO nanophosphors as promising red-emitting phosphors for both ultraviolet-based white light-emitting diodes and field-emission displays.

Keywords: Phosphors, Luminescence, Judd-Ofelt theory, Cathodoluminescence.

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