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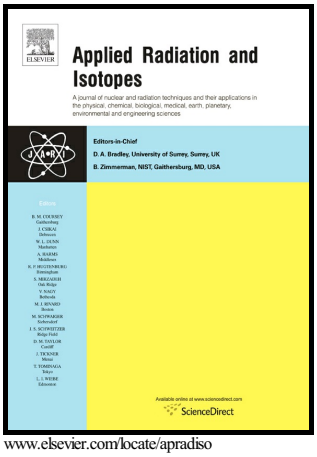

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PII: S0969-8043(18)30753-X
DOI: https://doi.org/10.1016/j.apradiso.2018.09.012
Reference: ARI8482

To appear in: *Applied Radiation and Isotopes*

Received date: 18 August 2018
Revised date: 10 September 2018
Accepted date: 11 September 2018

Cite this article as: Y.Z. Halefoglu, M. Yuksel, H. Derin, N. Can, M. Topaksu, E. Ozturk and E. Karacaoğlu, Preparation and photoluminescence properties of aluminate phosphors produced by combustion synthesis, *Applied Radiation and Isotopes,* https://doi.org/10.1016/j.apradiso.2018.09.012

Preparation and photoluminescence properties of aluminate phosphors produced by combustion synthesis

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Abstract

In this work, Eu, Nd co-doped MAl_2O_4:Eu, Nd (M = Ca, Sr, Ba) phosphors were synthesized at low temperatures (550°C) by the combustion method. The crystallinity of the phosphors was monitored by X-ray diffraction (XRD) and the morphology was examined by scanning electron microscope (SEM). Synthesis of phosphors, the effect of lanthanide concentrations on light emission intensity and duration investigated by using photoluminescence (PL) measurements. Narrow orange-red emissions from 500 to 750 nm in the PL spectra are assigned to $^5D_0 \rightarrow {}^7F_j$ (j=0,1,2,3,…) transitions of Eu^{3+} ion. In contrast, the broad luminescence band of the samples in the range of 400 to 500 nm are attributed to the 5d-4f transitions of Eu^{3+} ion in the same host materials. Investigated the effects of radiation on the severity of the trap depths of these structures. The decay curves of these phosphors show how long the phosphors are attenuated. Thermoluminescence (TL) glow curves have been recorded from room temperature to 300°C at a constant heating rate of 1°C/s after preheat process at 130°C for 10 second using lexsyg smart TL/OSL reader. Nd^{3+} trap levels can be thought of as the lanthanide element that causes long composition in the phosphorescence structure at room temperature.

Keywords: Combustion synthesis, photoluminescence, thermoluminescence, nanoparticle, long-persistent

1. INTRODUCTION

Rare earth doped aluminate structures, have so many areas of utilization due to their various outstanding characteristics such as luminescence properties, highly forgiving nature, radiation duration and high quantum efficiency (Fengfeng et al., 2017; Qu et al., 2018; Qi et al., 2017). These materials are promising in practical applications in many areas (Cui et al., 2017). Some examples for these areas can be given as; ceramic and glass products, electronics, light boards, the signing of highways, airports, and emergency exits in buildings, etc. (Katsumata et al.,1998; Matsuzawa et al., 1996). Alkaline aluminates (MAl_2O_4) are excellent luminescent materials (Zuniga-Rivera et al., 2017), especially for persistent luminescence, (Nazarov et al., 2017; Peng and Hong, 2007) when doped with rare-earth ions (Freeda and Subash, 2017; Blasse et al.,