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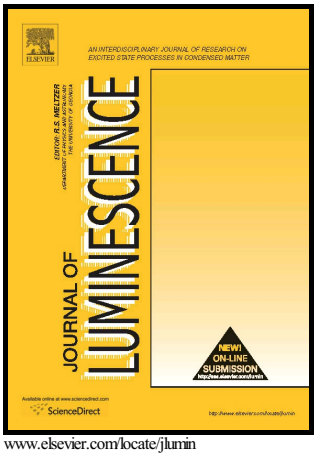

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Optically Stimulated Luminescence of CaF_2:Ce

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Abstract

Optically Stimulated Luminescence (OSL) is the luminescence emitted from a previously irradiated with ionizing radiation material by exposure to light. The aim of this paper is to evaluate the Blue Stimulation Luminescence (BSL) and Infra-Red Stimulation Luminescence (IRSL) for CaF_2:Ce produced by the Solution Combustion Synthesis (SCS) method. The results showed that the OSL response of CaF_2:Ce is strongly influenced by post-combustion thermal sintering temperature and dopant concentration. OSL response to dose are of the same order of magnitude of Al_2O_3:C, indicating the possibility of use of this material for radiation dosimetry.

Keywords: optically stimulated luminescence, CaF_2:Ce, radiation dosimetry

1. Introduction

Optically Stimulated Luminescence (OSL) is the dose-dependent luminescence emitted from a material in response to light of lower wavelength, previously exposed to ionizing radiation. The luminescence intensity is proportional to charge carriers trapped in appropriate sites, which in the band-gap model are represented by delocalized states within the semiconductor gap. This is the key feature that makes OSL a suitable technique for radiation dosimetry applications [1] [2]. There are several advantages of OSL dosimetry over thermoluminescence (TL) dosimetry, such as: (a) the readout method is all optical, so there is no need to heat the sample; (b) possible thermal quenching of luminescence is avoided; (c) compact, simple, relatively inexpensive and low energy consuming components [3].

Research on several promising new OSL materials is underway in various laboratories around the world [4] [5] [6]. Pure calcium fluoride (CaF_2) is an example of one of these OSL materials that has been recently studied, predominantly in its natural form of fluorite [7] [8] [9] [10]. The fluorite structure is interesting as it provides free space for small-sized impurities to modify several of the fluorite properties. However, the use of