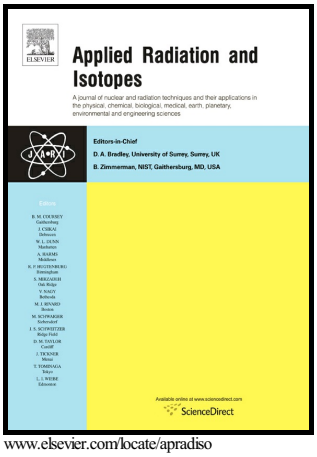

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Synthesis, thermoluminescence, defect centers and dosimetric characteristics of LiF:Mg,Cu,B phosphor

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Abstract

The present paper reports the thermoluminescence (TL), dosimetric characteristics and electron spin resonance (ESR) of LiF:Mg,Cu,B (MCB) phosphor synthesized by a solid state method. Its glow curve structure is similar to that of LiF:Mg,Cu,P (MCP) phosphor with the main dosimetric peak at 218°C. MCB is 12 times more sensitive than LiF:Mg,Ti and about 1.9 times less sensitive than MCP phosphor. A noteworthy feature is that the phosphor exhibits a linear dose response up to 100 Gy with a minimum detectable dose of 17 μGy. The TL emission spectrum was recorded and the post irradiation fading in MCB at ambient temperatures and humidity was negligible for a period of one month. Room temperature ESR spectrum of irradiated phosphor consists of at least two distinct centers. Centre *I* with an isotropic *g* factor 2.0061 is attributable to an *F*-center and is the likely recombination center for the main TL peak at 220°C. Center *II* characterized by a *g*-factor 2.0090 and an unusual broad line (linewidth ~ 415 gauss) is also identified as an *F*-center. A third defect center, observable during thermal annealing at high temperature, is assigned to another *F*-center.

Keywords: Thermoluminescence phosphor; Dose response; Thermoluminescence emission; Solid state reaction; Electron spin resonance; Defect centers

1. Introduction

Lithium fluoride based phosphors are an important class of thermoluminescence (TL) materials on account of their tissue equivalence and many useful dosimetric characteristics