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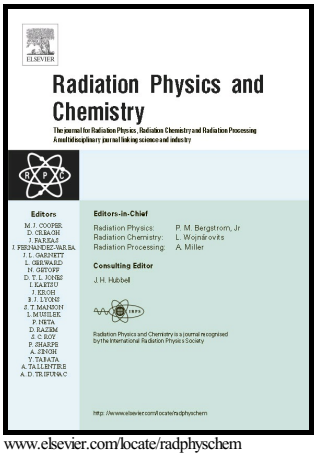

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Thermoluminescence response of rare earth activated Zinc Lithium Borate Glass

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Abstract

New glasses of zinc lithium borate doped with terbium oxide were synthesized by high temperature solid-state reaction. The amorphous nature of the glasses was confirmed using x-ray diffraction analysis (XRD). Thermoluminescence (TL) response of pure zinc lithium borate (ZLB) and zinc lithium borate doped with terbium (ZLB: Tb) exposed to gamma radiation was measured and compared. There is significant enhancement in the TL yields of ZLB: Tb compared to that of pure ZLB. Effect of varying concentration of dopant (Tb_4O_7) on the TL response of zinc lithium borate was investigated. 0.3mol% concentration of Tb exhibited strongest TL intensity. Thermoluminescence curve of the phosphor consist of single isolated peak. The TL response of the new materials to the exposed radiation is linear within 0.5-100 Gy range of dose with sublinearity at the lower region of the curve. High sensitivity was exhibited by the new amorphous materials. Reproducibility, thermal fading and energy response of the proposed TLD were investigated and shows remarkable result that made the phosphor suitable for radiation dosimetry.
Keywords: Thermoluminescence; Zinc Lithium borate; Terbium;

1. Introduction

Thermoluminescence dosimetry is one of the most popular techniques in the measurement of the Patient doses in diagnostic radiology, radiotherapy and routine monitoring of occupational exposure. It has therefore become part of the most widely used in radiation dosimetry. Thermoluminescence is a phenomena produced by thermal stimulation of radiation-induced electrons from the metastable defects of a material[1, 2]. The most common and widely used thermoluminescence materials are in crystalline form. Crystals are opaque and therefore highly light scattering. Thus only the light generated near the surface