

# Photoluminescence Studies of Stillwellite type Eu, Ho, Er co-doped Lanthanum Borosilicate Up Conversion Luminescent Materials for Solar Energy Applications

A. Karthikeyani <sup>1</sup>, N. Sathriya <sup>1</sup>, K. Anbukumaran <sup>2</sup>

<sup>1</sup>*Guru Nanak College, Chennai, Tamil Nadu, India*

<sup>2</sup>*University College of Engineering, Tindivanam, Villupuram District, Tamil Nadu, India*

## Abstract

In the present study, a new luminescent stillwellite type lanthanum borosilicate (doped with  $\text{Eu}^{3+}$  and co-doped with either  $\text{Er}^{3+}/\text{Ho}^{3+}$  or both) up-conversion materials were synthesized and characterized by photoluminescence studies. Using  $\text{Eu}^{3+}$  luminescence as a local probe, the microscopic symmetry around it in the host matrix is studied. Two cationic sites were found to exist. Co-doping of  $\text{Er}^{3+}$  and  $\text{Ho}^{3+}$ , has altered the PL line spectrum of  $\text{Eu}^{3+}$  into a broader one which could be explained based on carrier energy transfer model and this broadening is a proof for the existence of up conversion property in the new materials synthesized. Further, a blue shift is observed in the PL emission spectra by progressively increasing the excitation wavelength from 240 nm to 270 nm which, also infers the presence of successful up-conversion property in the newly developed material.

**Keywords:** Upconversion materials, Solar energy application, quantum efficiency enhancement, stillwellite type materials, photon up-conversion, luminescent materials, blue shift