

## **Thermoluminescence characteristics of copper activated calcium borate nanocrystals (CaB<sub>4</sub>O<sub>7</sub>:Cu)**

### **ABSTRACT**

The copper activated calcium tetraborate (CaB<sub>4</sub>O<sub>7</sub>:Cu) nanophosphor was synthesized by a combination of facile co-precipitation and thermal treatment methods for the first time. Thermoluminescence and dosimetric characteristics of the gamma irradiated CaB<sub>4</sub>O<sub>7</sub>:Cu nanophosphor was reported. The glow curves shows two well resolved TL peaks centered at about 120 °C and 260 °C. The copper concentration was varied from 1 to 3 mol% and it was found that the nanocrystalline CaB<sub>4</sub>O<sub>7</sub>:Cu with a dopant concentration of 2 mol% has the highest sensitivity among the other dopant concentrations. The results demonstrated that copper can enhance TL efficiency to 2.26 times more than that of un-doped nanocrystalline samples. Moreover, the dose response of the dosimetric peak at 260 °C follows a good linearity up to 3 kGy whereas the linearity of lower temperature peak at 120 °C extended up to 30 Gy. The linearity characteristic of the present nanophosphor suggests it as a candidate towards dosimetric applications.

**Keyword:** Copper; Calcium tetraborate; Nanophosphor; Thermoluminescence; Co-precipitation; Radiation dose