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Luminescent dynamics of $\text{GdTaO}_4\text{:Pr}^{3+}$

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Abstract content
 (Max 300 words)

Rare earth tantalates (MTaO_4) with $M = \text{Gd, Y, La}$, are being extensively studied for possible applications in X-ray imaging systems and mercury free fluorescent lamps, and field emission display (FED) devices due to their high luminescence efficiency, physical and chemical stability, strong irradiation hardness and good X-ray absorption.^{1,2} In recent years, trivalent praseodymium (Pr^{3+}) doped materials displaying red persistent luminescence are of considerable interest in the development of long persistent materials.³ In addition, the energy distribution of the defect levels within the forbidden region of these compounds is determined using thermoluminescence (TL) spectroscopy. Luminescent dynamics including fluorescence, phosphorescence, and thermoluminescence of Pr^{3+} in $\text{GdTaO}_4\text{:Pr}^{3+}$ is reported. X-ray diffraction (XRD) spectra indicated that $\text{GdTaO}_4\text{:Pr}^{3+}$ phosphor material is successfully prepared at 1200 deg;C using the solid state reaction method. Red and blue-green emissions were observed upon probing the materials with energetic photons using the DESY synchrotron radiation. A simplified energy transfer scheme explaining energy transfer from the TaO_4 group to either Gd^{3+} states in the $\text{GdTaO}_4\text{:Pr}^{3+}$ system is presented. After-glow measurements were carried out after UV irradiation at room temperature. The phosphorescence lifetime (τ) observed for $\text{GdTaO}_4\text{:Pr}^{3+}$ compound as a result of traps was 620 s. The depth of the trap levels was investigated from the TL data.

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