

Submicron-crystals of BaWO₄:Dy³⁺ and SrWO₄:Dy³⁺ synthesized by green chemistry method

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Nowadays, the investigation of oxide based light emitting materials for white light-emitting diodes (w-LEDs) applications have generated interest due to the advantages such as long lifetime, low energy consumption, high luminescence efficiency and environmental friendliness [1]. These qualities make them a strong candidate for the solid state lighting, display devices, optoelectronic devices and light-emitting diodes (LEDs). In this work, we present results of Dy³⁺: BaWO₄ and Dy³⁺: SrWO₄ that present luminescence close to white color (Figure 1) left. They were synthesized using coprecipitation method. The emission spectra exhibit four emission transitions centered at around 486 nm, 576 nm, 665 nm and 760 nm corresponding to the transitions ⁴F_{9/2}→⁶H_{15/2} (blue), ⁴F_{9/2}→⁶H_{13/2} (yellow) ⁴F_{9/2}→⁶H_{11/2} and ⁴F_{9/2}→⁶H_{9/2} ⁶F_{11/2} (red) respectively. Among these transitions ⁴F_{9/2}→⁶H_{15/2} and ⁴F_{9/2}→⁶H_{13/2} are observed to be strong whereas ⁴F_{9/2}→⁶H_{11/2} transition is found to be relatively quite weak. The ⁴F_{9/2}→⁶H_{13/2} transition is hypersensitive in nature and is strongly influenced by the environment around the Dy³⁺ ion site. It is observed in the luminescence spectra of these materials that the electric dipole transition is dominant compared to the magnetic dipole transition. The CIE diagram show emission close to white (Fig.1 right) for the five composition with little distortion of the color showing the influence of dopant concentration in the color of the emission.

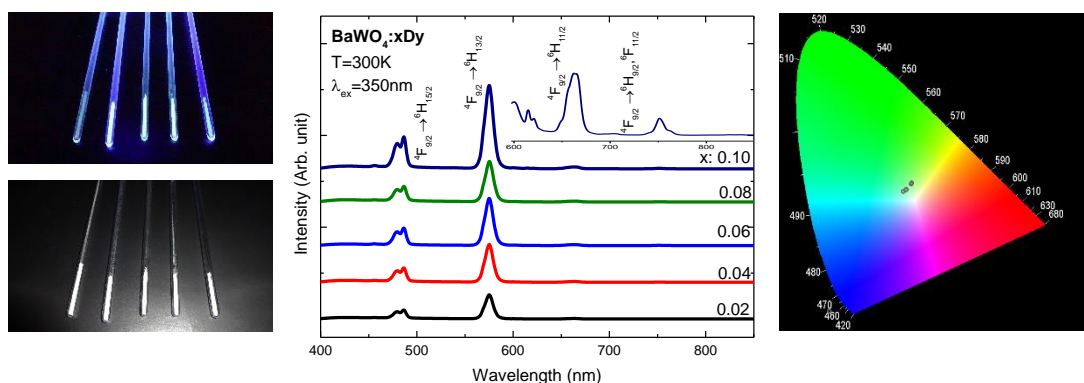


Figure 1. Dy³⁺: BaWO₄ under UV excitation (366nm) left, emission spectra under excitation at 350nm middle and chromaticity coordination diagram of BaWO₄:Dy³⁺ material.

Keywords: Dysprosium luminescence, Tungstate, white light.

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References

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