SAIP2025



Contribution ID: 167

Type: Poster Presentation

Study on the impact of Pr3+, Ce3+, and Pb2+ ions on luminescence properties of BaB8O13:Gd3+ for potential applications in phototherapy.

A series of BaB₈O₁₃ phosphors doped with different concentrations of (2.0 mol.%) Gd³⁺ ions and 1.0 mol.% co-doped with Pr³⁺, Pb²⁺, and Ce³⁺ ions were synthesized by solid-state synthesis method. The X-ray powder diffraction (XRD) analysis confirmed the pristine crystalline structure and uniformity of the compounds, with an average crystalline size of around 33 - 45 nm. Scanning Electron Microscopy (SEM) was performed to study the surface morphology of the compound and Fourier Transform Infrared (FT-IR) spectroscopy measurements determined the nature of bonding between elements of the compounds. The photoluminescence (PL) excitation spectra of BaB₈O₁₃:Gd³⁺ phosphor showed excitation peaks at 274 nm. The crucial role of gadolinium (Gd³⁺) ions in barium-based hosts lies in their narrowband emission spectrum, specifically at 311-315 nm, which is in narrow band ultraviolet B (NB-UVB) range and is attributed to the ⁶P_{7/2} to ⁸S_{7/2} transition and the prominent emission peak was observed at 340 nm that could result in oxygen vacancy from the BaB₈O₁₃. The effects of co-doping Pr³⁺, Pb²⁺ and Ce³⁺ ions with Gd³⁺ ions were observed. Emission at 313 nm can be used for the treatment of skin diseases. Based on phosphor host materials in Gd³⁺ activated materials or through energy transfers from sensitized dopant ions, enhanced PL emissions that are observed are pertinent for treatments of many skin diseases such as psoriasis, vitiligo, eczema, and many other skin conditions.

Apply for student award at which level:

None

Consent on use of personal information: Abstract Submission

Yes, I ACCEPT

Primary author: Dr LETSWALO, Machaba Leanyatsa Abraham (University of Johannesburg)

Co-authors: Mr SELAELO, Bethuel (University of Johannesburg); SONDEZI, Buyisiwe (University of Johannesburg)

Presenter: Dr LETSWALO, Machaba Leanyatsa Abraham (University of Johannesburg)

Session Classification: Poster Session

Track Classification: Track A - Physics of Condensed Matter and Materials