Contribution ID: **100** Type: **not specified**

Study of optical and energy transfer on co-activated ZnAl2O4:0.1% Tb3+, 0.1% Sm3+ nanomaterial prepared using the citrate precursor method.

Thursday, 16 November 2023 10:45 (15 minutes)

This study reports the analysis of energy transfer on zinc aluminate (ZnAl2O4) co-activated with terbium (Tb3+) and samarium (Sm3+) prepared by citrate precursor method. The nano-powders were prepared by using the citrate sol-gel method and annealed at 900 oC for 2 hrs for all samples. The X-ray powder diffraction (XRD) results revealed a single cubic structure of ZnAl2O4 and co-doping with Tb3+ and Sm3+ did not affect the structure of synthesized ZnAl2O4. Scanning electron microscope (SEM) results showed that co-doping the host material of ZnAl2O4 slightly affected the morphology of the synthesized nano-powders. Ultraviolet-visible (UV-Vis) reflection spectroscopy suggested that the band gap of co-doped ZnAl2O4:0.1% Tb3+, 0.1% Sm3+ is 1.58 eV. The photoluminescence (PL) results showed several emission peaks located at 416, 487, 542, 564, 597, 619, 644 nm. The peak at 416 nm may be assigned to the host material and the is no any other significant peak observed for the host material besides 416 nm which may be suggesting energy transfer (ET) from the host ⟶ Tb3+ and from host⟶Sm3+ when single and co-doping the host material. Emission peaks at 487, 542 and 619 may be attributed to the 5D4⟶7FJ = 6, 5 and 3 transitions of Tb3+ ion. The observed emission peaks located at 564, 597 and 644 nm may be attributed to 4G5/2⟶6H5/2, 4G5/2⟶6H7/2 and 4G5/2⟶6H9/2 transitions of Sm3+ (Mabelane et al., 2022). CIE coordinates results suggested that the emission colour can be tuned from the bluish colour to the violet colour which suggest colour tunability of the material. These results may be suggesting that the co-doping ZnAl2O4 may be used for solid state lighting materials.

Primary authors: DLAMINI, Clinton (south african); Mr MELATO, Lucas (Vaal university of technology); Dr MHLONGO, Rebecca (Sefako Makgatho health science university); Dr MAPHIRI, Vusani (Sefako makgatho health science university); Dr MOKOENA, Teboho (University of free state); Prof. MOTLOUMG, Setumo (Sefako makgatho health science university)

Presenter: DLAMINI, Clinton (south african)

Session Classification: Partner

Track Classification: Partner