Journal of
Materials Engineering and Applications

Abstract

Luminescent nanomaterials and their applications

Martin Ntwaeaborwa
University of the Witwatersrand, South Africa.

Abstract:
Phosphors have many uses today in applications such as electronic information displays, solid state lighting, solar cells, advertising and theft prevention. By using urea-assisted solution combustion method, we prepared tunable multicolour and white light emitting rare-earths (Pr3+ and Dy3+) doped oxyorthosilicate (R2SiO5) (R = La, Y, Gd) phosphors. We have investigated the photoluminescent properties of LaYSiO5:Dy3+;Pr3+, LaGdSiO5:Dy3+;Pr3+, GdYSiO5:Dy3+;Pr3+ and La2-xGdxSiO5:Dy3+;Pr3+ (x = 0, 0.5, 1.0, 1.5 and 2.0) in powders and thin film forms. The films were ablation deposited onto Si (100) substrates using the pulsed laser deposition technique. Several deposition parameters were varied, including vacuum versus partial pressure of gas (O2 or Ar), type of laser pulse, and substrate temperature. The samples were analyzed using X-ray diffraction, scanning electron microscopy (SEM), X-ray photoelectron spectroscopy (XPS), energy dispersive X-ray spectroscopy and photoluminescnt spectroscopy. The photoluminescent (PL) data were collected in air under excitation by either a 325 nm HeCd laser or a monochromatized xenon lamp. The PL intensities were strongly dependent on the Pr3+ and Dy3+ dopant concentrations, the ratio of La to Gd, deposition condition and post-deposition annealing. Data from the scanning electron microscopy and atomic force microscopy showed that the major influence of the deposition conditions on the PL intensity was through changes in the morphology and topography of the films, which affects light scattering and out-coupling. The colour purity of the bands estimated using CIE coordinates confirmed that our samples were emitting tunable multicolour and white light. The elemental composition analysis indicated that there was a correlation among the EDS, XPS and TOF-SIMS data. The structure, particle morphology, surface chemical composition and electronic states, photoluminescent properties and possible applications of these materials in UV-pumped LEDs will be discussed.

Biography:

Martin Ntwaeaborwa is professor of Physics at the University of the Witwatyersrand in South Africa. He obtained his PhD from the University of the Free State in 2006. Submitted his abstract on the conference on Frontiers in Nanotechnology and Nanomaterials; May 04-05, 2020; Vienna, Austria.

Recent Publications:

1. Martin Ntwaeaborwa et al; Structural and morphological characterization of photoluminescent cerium-doped near UV-blue sodium ortho-phosphate phosphors, 2020.
2. Martin Ntwaeaborwa et al; Up-conversion luminescence and energy transfer mechanism in ZnTiO3: Er3+,Yb3+ phosphor, 2020.
3. Martin Ntwaeaborwa et al; Luminescence properties of Eu doped ZnO PLD thin films: The effect of oxygen partial pressure, 2020.
4. Martin Ntwaeaborwa et al; Remarkable influence of alkaline earth ions on the enhancement of fluorescence from Eu3+iondopedinsodiumortho-phosphate phosphors, 2019.
5. Martin Ntwaeaborwa et al; Pulsed laser deposition of a ZnO:Eu3+ thin film: Study of the luminescence and surface state under electron beam irradiation, 2019.

Frontiers in Nanotechnology and Nanomaterials; May 04-05, 2020; Vienna, Austria

Citation: Martin Ntwaeaborwa; Luminescent nanomaterials and their applications; Nanotechnology 2020; May 04-05, 2020; Vienna, Austria.