

30<sup>th</sup> Annual Congress on  
**Nanotechnology and Nanomaterials**  
Joint Event on  
&  
8<sup>th</sup> World Congress on  
**Spectroscopy and Analytical Techniques**  
September 10 - 11, 2018 | Stockholm, Sweden

**Luminescent nanomaterials and their applications**



*Martin Ntwaeaborwa*

*University of the Witwatersrand,  
South Africa*

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 ( $\text{Pr}^{3+}$  and  $\text{Dy}^{3+}$ ) doped oxyorthosilicate ( $\text{R}_2\text{SiO}_5$ ) ( $\text{R} = \text{La}, \text{Y}, \text{Gd}$ ) phosphors. We have investigated the photoluminescent properties of  $\text{LaYSiO}_5:\text{Dy}^{3+};\text{Pr}^{3+}$ ,  $\text{LaGdSiO}_5:\text{Dy}^{3+};\text{Pr}^{3+}$ ,  $\text{GdYSiO}_5:\text{Dy}^{3+};\text{Pr}^{3+}$  and  $\text{La}_{2-x}\text{Gd}_x\text{SiO}_5:\text{Dy}^{3+};\text{Pr}^{3+}$  ( $x = 0, 0.5, 1.0, 1.5$  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 ( $\text{O}_2$  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 photoluminescent 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  $\text{Pr}^{3+}$  and  $\text{Dy}^{3+}$  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 Witwatersrand in South Africa. He obtained his PhD from the University of the Free State in 2006. He has published more than 235 papers in prestigious journals and has given numerous invited talks at local and international conferences.

ntwaeab@gmail.com

**Notes:**