LUMINESCENT PROPERTIES OF $SrGa_2S_4:Ce^{3+}$ THIN FILMS COATED WITH $TaSi_2$

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There is continuing need for phosphors with improving luminescence properties and discovery of such new phosphors with better properties is essential for the advancement of display technologies. The present work focuses on the synthesis of thin phosphor films made from commercially available $SrGa_2S_4:Ce^{3+}$ powder for application in flat panel field–emission displays (FP-FEDs). However, the successful utilization of the FED technique in the practical application requires development of cathodoluminescence (CL) phosphors exhibiting high efficiencies/brightness, high current densities (> 5 mA/cm^2), great long-term stability especially at low voltages (≤ 5 keV) and furthermore an efficient blue phosphor. Nevertheless, sulfide phosphors when subjected to prolonged electron exposure electron stimulated surface chemical reactions (ESSCR) occur on the surface. These result in a high degradation rate of the luminescence intensity and evolution of gases which have a detrimental effect on the emitter tips of the FED, thus reducing FED lifetime. Several coating techniques have been developed including coating with conductive oxides such as MgO, SiO_2, ZnO, Al_2O_3, InO_3 and SnO_2 in trying to overcome the problem of degassing from the sulfide based films. In this study the thin films prepared from $SrGa_2S_4:Ce^{3+}$ commercial phosphor powder by PLD technique were coated with metallic $TaSi_2$. The $TaSi_2$ metallic features and unique properties such as high electrical conductivity, low contact resistance, high melting point and good chemical stability makes it suitable material for use in application in field emission–emitter devices. Moreover, it is compatible to silicon substrate thus satisfying the requirements for the generation of nano-electronics. Shown below are some of the results for the coated films.

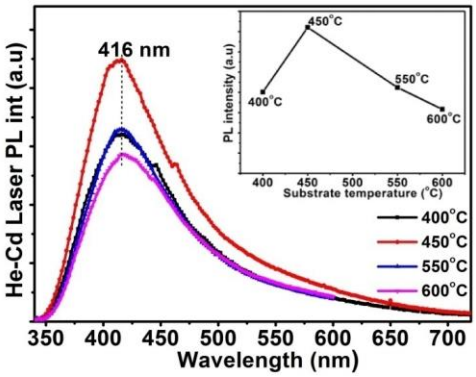

Fig. 1: PL emission spectra of $TaSi_2$ (600 pulses) coated $SrGa_2S_4:Ce^3$ (9000 pulses) films deposited at different substrate temperatures.

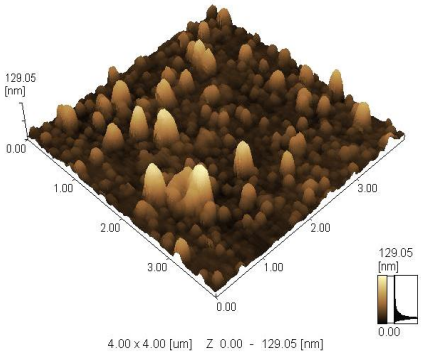

Fig. 2 The AFM image for the film deposited at 400ºC substrate temperature