Carbon nanotube-coated $ZnGa_2O_4:Mn^{2+}$ phosphor for field emission display

Je Hong Park, Boo Won Park, Nam Sik Choi, Jong Su Kim*
Division of Image Information Engineering, Pukyong National University, Pusan, 608-739, Korea
Phone: 82-051-620-1699, E-mail: jsukim@pknu.ac.kr

Keywords: Field emission Display, $ZnGa_2O_4:Mn^{2+}$, phosphors, Carbon nanotubes

Abstract

Carbon nanotubes (CNTs) are coated on green $ZnGa_2O_4:Mn^{2+}$ phosphor for filed emission display. The cathodoluminescent intensity of CNTs-phosphor is improved compared with uncoated phosphors. Also the effects of phosphors-coated CNTs on electrical and degradation characteristics are investigated to reveal the reason of the enhanced emission intensity.

1. Introduction

The field emission display (FED) is a promising candidate for the next generation of information display and has been supported by industry and government in recent years [1]. The FED is based on cathodoluminescence (CL), i.e., the emission of light as a result of excitation by electrons. The FED has used ZnS-based phosphors because typically more efficient than oxide phosphors under the same voltages and current densities. However, ZnS-based phosphors are unstable in high vacuum under electron bombardment conditions, and therefore they are decomposed so as to contaminate the cathode components. In view of this, oxide phosphors are preferred in FEDs.

In this paper, carbon nanotubes (CNTs) are coated on green $ZnGa_2O_4:Mn^{2+}$ phosphor particles to improve its CL intensity and degradation characteristics. Also the electrical properties of CNTs-coated phosphor are investigated.

2. Experimental

The CNTs-coated $ZnGa_2O_4:Mn^{2+}$ phosphor is obtained by initially mixing CNTs with starting materials of phosphors and sintering the mixture through a conventional solid-state reaction at 1100 °C for 4 hours under nitrogen ambient. Cathodoluminescence (CL) measurements were performed a using Gatan MonoCL-2 system.

3. Results and discussion

The CL spectrum of CNTs-coated $ZnGa_2O_4:Mn^{2+}$ phosphor is shown in Fig. 1. The green peak at 505 nm results from Mn^{2+} ions [2]. The emission intensity of CNT-coated phosphor is 10% enhanced compared with an uncoated phosphor. This is the reason why the conductive CNT causes to increasing the electrical conductivity leading to the reduction of electron charging effect at phosphor surface.

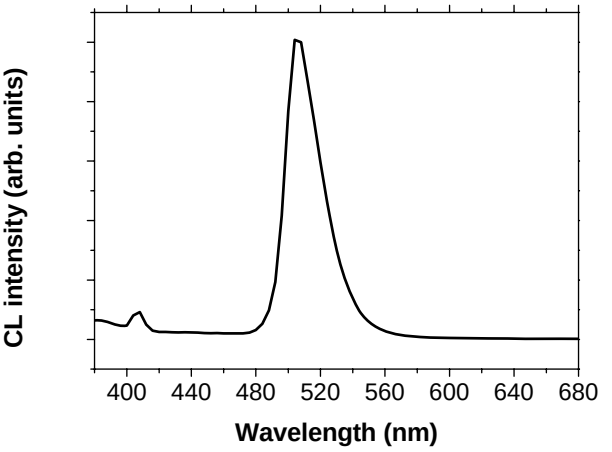

Fig.1. CL spectra of CNTs-coated green $ZnGa_2O_4:Mn^{2+}$ phosphor.

4. Summary

The emission intensity of CNT-coated phosphor is 10% enhanced compared with an uncoated phosphor. Our CNTs-coated green $ZnGa_2O_4:Mn^{2+}$ phosphor can give a good example to prevent the chemical

degradation and to enhance the luminance.

Acknowledgements

This work was supported by Pukyong National University Research Fund in 2005 (PKS-2005-005).

5. References

1. Lauren E. Shea, The Electrochemical Society Interface, **27**, p24- (1998).

2. J. S. Kim, J. S. Kim, T. W. Kim, S. M. Kim, and H. L. Park, Appl. Phys. Lett., **86**, p091912 (2005).