MASTER'S THESIS

Vacuum ultra-violet (VUV) excited phosphors

Cheng, Pui Yan

Date of Award:
2006

Vacuum Ultra-Violet (VUV) Excited Phosphors

CHENG Pui Yan

A thesis submitted in partial fulfillment of the requirements

for the degree of

Master of Philosophy

Principal Supervisor: CHEAH Kok Wai

Hong Kong Baptist University

August 2006

Abstract

Phosphors in some new displays and lighting devices are excited by vacuum ultra-violet (VUV) radiation. The luminescence characteristics and the properties of phosphor under VUV excitation are an interesting area to investigate. In this project, different techniques to synthesize phosphor such as solid state reaction, microwave method, combustion and precipitation were used. The solid state reaction method can produce a relative brightness phosphor and the synthesizing condition is easy to control; the precipitation method can produce an evenly distributed elliptical phosphor. Several types of phosphor were fabricated from these different synthesizing techniques. The spectroscopic studies on red phosphor $YAl_3(BO_3)_4:Eu^{3+}$ and on green phosphor $BaMgAl_{14}O_{17}:Eu^{2+},Mn^{2+}$ were carried out. The photoluminescence (PL) spectrums of the red and green phosphor are dominant by 617nm and 517nm respectively. From their photoluminescence excitation (PLE) spectrums, they have an excitation peak in the VUV region (150nm) due to the host lattice absorption. Moreover, under VUV excitation, the effect of the Eu^{3+}-doping concentration in the red phosphor and Eu^{2+}-doping concentration in the green phosphor are different from UV excitation. The optimum concentration in red phosphor under VUV and UV excitation is 20% while that under UV excitation is 100%. The optimum concentration changes with the excitation energy. The optimum concentration levels of europium in green phosphor under VUV and UV excitation are 4% and 10%. Lastly, the CIE chromaticity coordinate of green phosphor is closer to the standard coordinate by mixing two green phosphors with different chromaticity.

Contents