The effects of inserting multi-dielectric structure in the phosphor layer on the properties ofelectroluminescent devices

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ABSTRACT

In this thesis, the "multi-barrier dielectric layers structure" insertinginto the phosphor layer is proposed. It was expected that these layers would (i)generate extra interface states contributing to the number of source electrons available for excitation, and (ii) act as tunneling layers across which the drop in field would result in a high energy gain for those electrons thattunnel through, thereby increasing excitation efficiency. It should be noted that the thicknesses of the phosphor and barrier dielectric layers must be smaller than the electron mean free path and can be tunneled by electrons inhigh electrical field. Although the transfer charge is reduced but the brightness is improved when barrier layers are present. This is due to extra traps that are generated at the phosphor and dielectric barrier layer interface,since we can not only consider the transfer that measured by Saywer-Tower circuit. In this work, The SrS:Pr+3,Ce+3 was used as white light emission phosphor and deposited by magnetron r.f. sputtering and e-beam system. These exits an absorption problem in conventional double insulator structure. In order to resolve this problem, the stack structure for SrS:Pr and SrS:Ce phosphor layerswith windows effects was also proposed. For our experiment results, the insertion of "multi-barrier dielectric layers structure" in the phosphor layerwith window effects can improve the white electroluminescent displays efficiency. The brightness > 120 cd/ m^2 , threshold voltage reducing to 120 V,CIE coordinates x=0.36, y=0.36 and efficiency > 0.6 lm/W can be obtained for the windowed ELD with multi-barrier dielectric layers.

Keywords : electroluminescent ; multi-barrier ; window structure ; SrS ; Ce+3 ; Pr+3

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