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Novel recommendation for enhancing optical properties of CP-WLEDs by $Ba_2Si_5N_8Eu^{2+}$ phosphor

Van-Duc Phan[1], Minh Tran[2], Q. S. Vu[3]
[1]Faculty of Automobile Technology, Van Lang University, Ho Chi Minh City, Vietnam
[2]Optoelectronics Research Group, Faculty of Electrical and Electronics Engineering, Ton Duc Thang University, Ho Chi Minh City, Vietnam
[3]School of Engineering-Technology and Arts, Hong Bang International University, Ho Chi Minh City, Vietnam

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ABSTRACT

In this paper, the $Ba_2Si_5N_8Eu^{2+}$ phosphor is proposed as the novel recommendation for enhancing the optical properties in terms of D-CCT, CRI, CQS, and LO of the CP-WLEDs. Firstly, we conducted the physical model of the CP-WLEDs in the LightTools software with the main parameters like the real LEDs. Furthermore, the scattering process in LEDs compound of the CP-WLEDs is simulated and investigated by the Matlab software. Then the influence of the $Ba_2Si_5N_8Eu^{2+}$ concentration on the D-CCT, CRI, CQS, and LO of the CP-WLEDs is investigated. Finally, the research results showed that the Ba2Si5N8Eu2+ concentration has a considerable effect on the D-CCT, CRI, CQS, and LO of the CP-WLEDs. From the results, we can state that the $Ba_2Si_5N_8Eu^{2+}$ phosphor can be considered as the novel recommendation for enhancing the optical properties of the CP-WLEDs.

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Corresponding Author:

Minh Tran
Optoelectronics Research Group
Faculty of Electrical and Electronics Engineering
Ton Duc Thang University
Ho Chi Minh City, Vietnam
Email: tranhoangquangminh@tdtu.edu.vn

1. INTRODUCTION

In the lighting revolution trend for improving civilian everyday life in over the world, the InGaN-based white-light-emitting diodes (LEDs) can be considered as the primary solution in comparison with the conventional lighting method based on the excellent advantages such as environment-friendly, energy efficiency, compactness, long lifetime, and designable features [1-3]. Nowadays, phosphor-converted LEDs (pcLED) combines a blue LEDs chip, and the yellow emitting phosphor is the novel solution for lighting in civil and industrial purposes [4, 5]. In the last few years, authors in many research focused on enhancing the lighting properties of the white LEDs. Authors in [6, 7] proposed and investigated the effect of the phosphor layer thickness and concentration on the optical properties of white LEDs and concluded that the lower phosphor concentration and higher phosphor thickness led to the higher luminous efficacy. Furthermore, the authors in [8] stated that the spatial color distribution (SPD) of white LEDs is significantly affected by the phosphor layer parameter such as thickness, concentration, and size. As studied in [9-12], the blue light and yellow light have a similar radiation pattern that can be lead to improving the SPD by varying the phosphor layer location of the white LEDs. Besides, the green and red phosphor by adding to the phosphor layer can be considered as a novel solution for enhancing the optical properties of the white LEDs as in [13-15].