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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

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Replacing GB/T 23595.7-2010

Test methods of rare earth phosphors for LED - Part 7: Determination of thermal quenching

LED用稀土荧光粉试验方法 第7部分：热猝灭性能的测定

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents" Drafting.

This document is part 7 of GB/T 23595 Test methods for rare earth phosphors for LEDs. GB/T 23595 has been published for the following part.

- Part 1: Determination of spectrum;

- Part 2: Determination of relative brightness;

- Part 3: Determination of chromaticity coordinates;

- Part 4: Determination of high temperature and high humidity performance;

- Part 5: Determination of pH value;

- Part 6: Determination of electrical conductivity;

- Part 7: Determination of thermal quenching properties;

- Part 8: Determination of high voltage accelerated aging performance.

This document replaces GB/T 23595.7-2010 "Test methods for rare earth yellow phosphors for white light LED lamps Part 7: Thermal quenching Compared with GB/T 23595.7-2010, in addition to structural adjustments and editorial changes, the main technical changes are as follows.

a) Changed the scope of application from "440nm~480nm" to "350nm~480nm" (see Chapter 1, 2010 Edition) Chapter 1);

b) Added terms and definitions (see Chapter 3);

c) The principle of the method has been changed (see Chapter 4, Chapter 2 of the 2010 edition);

d) The equipment has been changed (see Chapter 5, Chapter 3 of the 2010 edition);

e) The provisions on samples have been changed (see Chapter 6, Chapter 4 of the 2010 edition);

f) Added test environment (see Chapter 7);

g) The test steps have been changed (see Chapter 8, Chapter 5 of the 2010 edition);

h) The precision has been changed (see Chapter 10, Chapter 7 of the 2010 edition).

Please note that some of the contents of this document may involve patents. The issuing organization of this document does not assume the responsibility for identifying patents.

This document was proposed and coordinated by the National Rare Earth Standardization Technical Committee (SAC/TC229).

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This document was first published in 2010 and this is the first revision.

Introduction

In recent years, with the continuous development of semiconductor lighting and display technology, higher requirements have been placed on the performance of phosphors.

From using only blue LED yellow phosphor to using UV-blue LED blue-green/yellow/yellow-green/red phosphor.

and blue LED green/red phosphors, forming a garnet structure aluminate yellow/yellow-green phosphor, nitride red phosphor LED rare earth phosphor products of mainstream systems such as phosphor powder, silicate green/yellow phosphor, nitrogen oxide blue-green phosphor, etc. are becoming more and more diverse.

The more abundant the products are, the higher the requirements for comprehensive product performance are, especially the new requirements for product reliability are put forward.

With the use of rare earth phosphor products and technological changes, it is necessary to establish a unified evaluation method that conforms to existing technologies.

GB/T 23595 "Test methods for rare earth phosphors for LEDs" consists of 8 parts.

- Part 1: Determination of spectrum;

- Part 2: Determination of relative brightness;

- Part 3: Determination of chromaticity coordinates;

- Part 4: Determination of high temperature and high humidity performance;

- Part 5: Determination of pH value;

- Part 6: Determination of electrical conductivity;

- Part 7: Determination of thermal quenching properties;

- Part 8: Determination of high voltage accelerated aging performance.

In recent years, with the development of semiconductor lighting technology, the number of phosphor systems has gradually increased, and its application areas have continued to expand, including ordinary color rendering, Market segments such as high color rendering, full spectrum, high-power lighting and ordinary color gamut display require higher precision in the excitation and emission spectra of phosphors.

In terms of spectral testing instruments, the detection speed, measurement range, stability and measurement accuracy of phosphor samples have been significantly improved.

The specified test range, test accuracy and error cannot meet the actual application requirements. This document focuses on the expansion of the scope of application, the use of The thermal quenching performance is used to characterize the optical properties of the phosphor after heating, and the rare earth phosphor components, standard samples, excitation wavelength range and The system standardizes the precision, etc., improves the accuracy and applicability of product testing, and helps domestic and foreign LED rare earth phosphor manufacturers Production guidance and usage specifications for the industry and related industries.

Test methods for rare earth phosphors for LED Part 7: Determination of thermal quenching properties

1 Scope

This document describes the method for determining the thermal quenching of rare earth

phosphors for LEDs excited by ultraviolet to blue light with wavelengths ranging from 350nm to 480nm.

This document is applicable to the determination of thermal quenching properties of rare earth phosphors for LEDs excited by ultraviolet to blue light with a wavelength of 350nm~480nm.

2 Normative references

GB/T 5838.1

GB/T 8170

3 Terms and definitions

The terms and definitions defined in GB/T 5838.1 and the following apply to this document.

3.1 Phie

The power of light passing through a specific area per unit time.

3.2

A set of parameters used to characterize the color of the light emitted by the phosphor after being excited is calculated according to the CIE1931 standard chromaticity observer rule.

3.3 Dx

In the CIE1931 coordinate system, the distance between one chromaticity coordinate and another chromaticity coordinate.

3.4 Thermal quenching

When the temperature rises to a certain level, the luminous intensity of the luminescent material will decrease significantly.

4 Principles of the method

Using the phosphor excitation spectrum and thermal quenching analysis system, the light (radiation) function of the sample is analyzed at room temperature with a specific wavelength as the excitation wavelength.

After the temperature reaches 180°C and is kept constant for 20 minutes, the light (radiation) power and chromaticity coordinates of the sample are measured again.

The thermal quenching performance of the phosphor is characterized by the amplitude of light (radiation) power change, chromaticity coordinate change and chromaticity coordinate