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GB/T 46135.2-2025

Test methods for organic luminescence electronic and hole functional material - Part 2: Optical properties

有机发光电子/空穴功能材料测试方法 第2部分：光学性能

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Standardization Administration of the PRC

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part

1.Structure and Drafting Rules of Standardization Documents". Drafting. This document is Part 2 of GB/T 46135, "Test Methods for Organic Light-Emitting Electron/Hole Functional Materials". GB/T 46135 has been issued. The following parts were laid out.

1.Thermal Properties;

2.Optical Properties;

3.Purity. Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents. This document was proposed and is under the jurisdiction of the National Technical Committee on Standardization of Semiconductor Equipment and Materials (SAC/TC203). This document was drafted by: Guangdong Agreya Optoelectronic Materials Co., Ltd., China Electronics Technology Standardization Institute, and Jilin OLED Optoelectronics. Materials Co., Ltd., Beijing Dingcai Technology Co., Ltd., Sichuan Agre New Materials Co., Ltd., Nanjing Gaoguang Semiconductor Materials Co., Ltd. The companies are. Hefei Dingcai Technology Co., Ltd., Changchun Haipuruns Technology Co., Ltd., and Beijing Greenman Technology Co., Ltd. The main drafters of this document are. Dai Lei, Pan Tonghen, Wu Yiran, Sun Feng, Gao Wenzheng, Zhao Junsha, Gao Yaoxiang, Ma Xiaoyu, Xu Xuanzong, and Zhuang Jianhong. Cao Kewei, Su Zongjie, Chen Jingsheng, Shi Zeyuan, Guo Jianhua, Zhang Baoshuai, Li Yilang, Qian Chao, Zhang Yan, Li He, Wang Tie, and Lü Yao.

Organic light-emitting diodes (OLEDs) are a type of self-emissive display technology. Their core principle is that an organic material layer emits light directly when electricity is applied. It boasts numerous advantages, including ultra-thinness, ultra-wide viewing angle, flexibility, high color gamut, and transparency. Organic light-emitting electron/hole functional materials are organic material layers. One of the core components, it plays a key role in organic light-emitting displays. Purity (content of main substance, content of metallic elements,

halogen content), melting point, glass transition temperature, thermal stability, ultraviolet-visible absorption light Spectroscopy, fluorescence spectrum, phosphorescence spectrum, and the refractive index and extinction coefficient, chromaticity, brightness, luminous efficiency, and luminance of the prepared organic light-emitting diodes. Aging is a crucial indicator for organic light-emitting electron/hole functional materials, and these indicators are vital for controlling production processes and improving product quality. Therefore, it is necessary to establish testing methods for organic light-emitting electron/hole functional materials. GB/T 46135 aims to provide test methods for various properties of organic light-emitting electron/hole functional materials, and is proposed to consist of three parts.

1.Thermal Properties. The aim is to provide a testing method for the thermal properties of organic light-emitting electron/hole functional materials.

2.Optical Properties. The aim is to provide testing methods for the optics of organic light-emitting electron/hole functional materials.

3.Purity. The aim is to provide a method for testing the purity of organic light-emitting electron/hole functional materials. Test methods for organic light-emitting electron/hole functional materials Part

1 Scope

GB/T 46135.2-2025 is the Chinese national standard covering the optical properties of the transport layers - the absorption and emission, the refractive index and extinction coefficient that govern the optical cavity of the device, and the film measurements needed for each. Part 2 of the series, with the luminescent material methods GB/T 37946.1-2025. First edition, in force from 1 May 2026. Issued on 5 October 2025, it has been in force since 1 May 2026.

This document describes the testing methods for the optical properties of electron/hole functional materials used in organic light-emitting displays, mainly including the ultraviolet-visible optical properties of the materials. Absorption spectrum, fluorescence spectrum, phosphorescence spectrum, and the refractive index, extinction coefficient, chromaticity, brightness, and luminous efficacy of the prepared organic light-emitting diode. Test methods for optical properties such as efficiency, brightness, and aging. This document applies to the research, development, production, and application of various organic light-emitting display electron/hole functional materials (hereinafter referred to as "organic functional materials"). Used for verification, inspection, and testing.

2 Normative references

The contents of the following documents, through normative references within the text, constitute essential provisions of this document. Dated citations are not included. For

references to documents, only the version corresponding to that date applies to this document; for undated references, the latest version (including all amendments) applies. This document.

GB/T 20871.12 Organic light-emitting diode display devices - Part 1-

3 Terms and Definitions

The terms and definitions defined in GB/T 20871.12 and the following terms and definitions apply to this document.

3.1 A spectral scanning technique that records the emission spectrum over time yields the emission of a sample after excitation at different decay times. Spectrum.

3.2 Data slicing For time-resolved emission spectrum data processing, data within a specific time range is sliced and processed separately to obtain the emission data for that time range. spectrum.

4 General Requirements

Unless otherwise specified, the test shall be conducted in the following environment.

---Ambient temperature. 15°C~30°C.

---Relative humidity. 25%~85%.

---Atmospheric pressure. 86kPa~106kPa.

5.1 Ultraviolet-Visible Absorption Spectroscopy

5.1.1 Principle Valence electrons in sample molecules can selectively absorb ultraviolet or visible light, transitioning from the ground state to an excited state, forming ultraviolet-visible absorption. Record the wavelengths corresponding to the absorption peaks in the ultraviolet-visible absorption spectrum, and take the tangent line at the longer wavelengths of the ultraviolet-visible absorption spectrum. The x-coordinate of the intersection of the line and the x-axis is used to calculate the band gap energy Eg using formula (1). Eg= (1) In the formula. Eg

--- Band gap energy, measured in electron volts (eV); lambda

--- Draw a tangent at the longer wavelength of the ultraviolet-visible absorption spectrum, and take the x-coordinate of the intersection of the tangent and the x-axis, in nanometers (nm).

5.1.2 Reagents The requirements for organic solvents used in preparing solution samples are as follows:

--- It is advisable to use solvents such as dichloromethane, toluene, tetrahydrofuran, and

2-methyltetrahydrofuran, which can completely dissolve the sample and form a homogeneous solution. The liquid must be free of air bubbles or suspended matter;

---The solvent does not react chemically with the sample; The solvent itself must not have interfering absorption near the wavelength being measured;

---Use solvents of analytical grade or higher.

5.1.3 Instruments and Equipment The requirements for instruments and equipment are as follows:

---UV-Vis spectrophotometer, equipped with a quartz cuvette with a 10mm optical path, wavelength range. 185nm~900nm.

---Electronic balance, with an accuracy of not less than 0.1mg.

5.1.4 Sample Preparation The samples can be divided into solution samples and thin film samples, and their preparation process is as follows:

---For solution samples, weigh the organic functional material sample using an electronic balance, add organic solvent, and prepare a solution with a molar concentration of 10^-4 mol/L. A 10^-6 mol/L sample solution was transferred to a cuvette and prepared for analysis.

---Thin film samples, organic functional material samples weighed using an electronic balance, are deposited in thin film form via vacuum evaporation or spin coating. The film is loaded onto a plain glass or silicon wafer, with a thickness of 100 nm, and is ready for testing.

5.1.5 Test Procedure The testing steps are as follows: