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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 37946.4-2025

Test methods for organic luminescence material - Part 4: Electrical properties

有机发光材料测试方法 第4部分：电学性能

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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 4 of GB/T 37946, "Test Methods for Organic Luminescent Materials". GB/T 37946 has already published the following parts.

1.Optical Testing;

2.Thermal Properties;

4.Electrical properties. 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., Sichuan Agre New Materials Co., Ltd., Hefei Dingcai Technology Co., Ltd., Beijing Yanhua Jilian Optoelectronic Technology Co., Ltd. The company, Beijing Dingcai Technology Co., Ltd., Changchun Haipuruns Technology Co., Ltd., Ningbo Lumilan New Materials Co., Ltd., and Shaanxi Light. Optoelectronic Materials Co., Ltd., Nanjing Gaoguang Semiconductor Materials Co., Ltd., and Zhejiang Huaxian Optoelectronic Technology Co., Ltd. The main drafters of this document are. Dai Lei, Pan Tonghen, Wu Yiran, Sun Feng, Zhao Junsha, Gao Yaoxiang, Gao Wenzheng, Xu Xuanzong, Ma Xiaoyu, and Zhuang Jianhong. Cao Kewei, Su Zongjie, Shi Zeyuan, Li Yilang, Zhang Baoshuai, Deng Yongliang, Guo Jianhua, Zhang Yan, Hang Deyu, Jin Wei, Yang Lei, Li He, Qian Chao, Zhao Xiaoyu Wang Tie.

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 an electric current is applied, resulting in superior light emission. Organic light-emitting materials (OLEDs) offer

numerous advantages, including thinness, ultra-wide viewing angle, flexibility, high color gamut, and transparency. OLEDs are a core component of organic material layers and play a crucial role in... Organic light-emitting displays play a crucial role. GB/T 37946, "Test Methods for Organic Light-Emitting Materials," aims to provide test methods for various properties of organic light-emitting materials, and is proposed to consist of four parts. constitute.

1.Optical Testing. The aim is to provide the UV-Vis absorption spectrum, fluorescence spectrum, phosphorescence spectrum, and other optical spectra of organic luminescent materials. Optical tests were conducted on the prepared organic light-emitting diodes, including their refractive index and extinction coefficient, chromaticity, luminance, luminous efficiency, and luminance aging. method.

2.Thermal Properties. The aim is to provide information on the thermal stability, melting point, glass transition temperature, and high-temperature aging properties of organic light-emitting materials. Test methods for thermal properties.

3.Purity. The purpose is to provide information on the purity of organic light-emitting materials, including the content of the main substance, metal elements, and halogens. Test method.

4.Electrical Properties. The aim is to provide information on the molecular orbital energy levels of organic light-emitting materials and the organic light-emitting diodes (OLEDs) fabricated from them. Methods for testing electrical properties such as voltage and carrier mobility. Test methods for organic light-emitting materials Part

1 Scope

GB/T 37946.4-2025 is the Chinese national standard covering the electrical behaviour of an OLED emitter - the carrier mobility and the injection barriers measured on single-carrier devices, the ionisation potential and electron affinity that decide whether the layers align, and the current-voltage characteristic. Part 4 of the series, with Part 1 on optical tests. 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 electrical properties of organic light-emitting materials, including the molecular orbital energy levels of the organic light-emitting materials. The voltage and carrier mobility of the prepared organic light-emitting diodes. This document applies to the research, development, production, application verification, testing, and inspection of organic light-emitting materials for various organic light-emitting displays.

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 Displays - 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 carrier mobility The average drift velocity of charge carriers under a unit electric field.

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

---Temperature. 15°C~30°C.

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

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

5 Molecular orbital energy levels

5.1 Test Principle The molecular orbital energy levels of organic light-emitting materials were measured using cyclic voltammetry. The principle of this method is to apply a cyclic voltammetry method to the working electrode in an electrolytic cell. At a certain positive potential (relative to the reference electrode), the organic light-emitting material molecules adsorbed on the electrode surface lose electrons from their valence bands, resulting in electrochemical oxidation. The initial potential Eox of the chemical reaction corresponds to the highest occupied energy level (HOMO level) in the molecular orbital. When a certain negative potential is applied to the working electrode (relative to the reference electrode), the conduction band of the organic light-emitting material molecules adsorbed on the electrode surface is...