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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 44004-2024

**Nanotechnologies - Test methods for the characterization of
organic transistors and materials**

纳米技术 有机晶体管和材料表征试验方法

(English Translation)

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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 modified to adopt IEC 62860:2013 "Test methods for characterization of organic transistors and materials":

This document has made the following structural adjustments compared to IEC 62860:2013:

- Chapter 1 corresponds to 1:1 of IEC 62860:2013;
- Added Chapter 2 normative references;
- Chapter 3 corresponds to Chapter 2 of IEC 62860:2013;
- Adjusted the order of terms and definitions in 3:1 to comply with the principle of classifying and arranging terminology items according to the concept hierarchy;
- Chapter 4 corresponds to 1:3 of IEC 62860:2013;
- Chapter 5 corresponds to 3:2~3:3 in IEC 62860:2013;
- 6:1 corresponds to 3:4:1 in IEC 62860:2013;
- 6:2 corresponds to 3:1 in IEC 62860:2013;
- 6:3~6:5 correspond to 3:4:2~3:4:4 in IEC 62860:2013;
- 6:6 corresponds to 3:4:5 in IEC 62860:2013;
- 6:7 corresponds to 3:4:6 in IEC 62860:2013;
- References correspond to Appendix A in IEC 62860:2013:

The technical differences between this document and IEC 62860:2013 and their reasons are as follows:

- Deleted 1:2 "Purpose" in IEC 62860:2013 to comply with the provisions in GB/T 1.1-2020;
- Change the second sentence of 2:1 introductory words in IEC 62860:2013 to a note to comply with the provisions in GB/T 1.1-2020 (see 3.1);
- The terms "turn-on voltage", "bottom contact device", "bottom gate device", "top contact device", "top gate device", "excitation voltage", "earth Grounding", "EMI/RFI", "subthreshold swing", because these terms are used only once in this document;
- The abbreviations EMI, IEEE, NIST, OET, OST, PFET, RFI and UV have been deleted because they are not used in this document:

Abbreviation:

The following editorial changes were made to this document:

- In order to coordinate with the existing standards, the name of the standard is changed to "Nanotechnology Organic Transistor and Material Characterization Test Method";
- Added the explanation of symbols and units in formula (1) to formula (5);

--- As Annex B in IEC 62860:2013 is not applicable to this document, the informative Annex B is deleted:

Introduction

This document covers the recommended methods and reporting requirements for the characterization of the electrical properties of organic transistors:

This document describes common sources of measurement error and provides recommended procedures to minimize the risk of error:

Minimize and/or characterize the impact of each measurement:

In order to standardize the analytical report data, this document also provides reporting requirements, including descriptions of environmental conditions and sample size, so that researchers can these reporting requirements also support the reproducibility of results so that new findings can be more effectively confirmed:

This document aims to facilitate the development of organic transistors from the laboratory to industry: Standardized characterization methods and reporting requirements provide information for effective Comparison provides a means and lays the foundation for production and manufacturing:

nano technology

Organic transistors and materials characterization test methods

1 Scope

This document describes a method for characterizing organic transistors, including the measurement technique, data reporting method, and test conditions for the characterization process:

This document applies to the measurement of electrical characteristics of organic transistors:

2 Normative references

This document has no normative references:

3 Terms, definitions and abbreviations

3.1

Terms and Definitions the following terms and definitions apply to this document:

Note: For terms not defined in this clause, refer to IEEE100:

3.1.1

Source

Device electrodes where the current flow is controlled by the conductivity of the semiconductor channel:

NOTE: All voltages within the device are normally referenced to the voltage on the SOURCE:

3.1.2

Drain

Device electrodes where the current flow is controlled by the conductivity of the semiconductor channel:

Note: The drain is usually the same as the source: The sign of the bias voltage at the drain relative to the source depends on the nature of the majority carriers: The bias voltage is more positive for electrons and more negative for the hole is more negative:

3.1.3

Gate

A device electrode that controls the flow of current through a semiconductor channel between source and drain when a voltage is applied:

3.1.4

bulk

Electrical connection to the substrate:

Note: The bulk bias voltage is usually applied through the ground platform only during device testing: The current through the substrate is usually negligible, so in most cases in this case, no voltage is applied to the bulk during device operation: However, during the testing of a single device, it is necessary to verify whether the current is negligible:

Most organic field-effect transistors (OFETs) are located on insulating substrates, so the bulk electrical properties are usually ignored:

3.1.5

characteristic

The relationship between the drain-source current (3:1:16) and the drain-source voltage (3:1:9) when the gate-source voltage (3:1:10) remains unchanged:

Note: See output characteristic curve (3:1:8):