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

GB/T 1555-2023

Replacing GB/T 1555-2009

**Test methods for determining the orientation of a
semiconductive single crystal**

半导体单晶晶向测定方法

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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 replaces GB/T 1555-2009 "Method for determination of crystal orientation of semiconductor single crystals". Compared with GB/T 1555-2009, except for structural adjustment In addition to general and editorial changes, the main technical changes are as follows:

- a) The scope of application of the X-ray diffraction orientation method has been changed (see Chapter 1, Chapter 1 of the.2009 edition);
- b) Added test conditions (see Chapter 4);
- c) The principle of the X-ray diffraction orientation method has been changed (see 5.1, Chapter 4 of the.2009 edition);
- d) Added sample requirements (see
- e) Changed the test data processing (see 5.6, Chapter 14 of the.2009 edition);
- f) Changed the precision of the X-ray diffraction orientation method (see 5.7, Chapter 15 of the.2009 edition);
- g) Changed the interference factors of the light pattern orientation method (see 6.2.1, 12.1 of the.2009 edition);
- h) The grinding materials used in the grinding process have been changed (see 6.4.1, 11.1 of the.2009 edition);
- i) Changed the corrosion temperature range of silicon single crystal materials (see 6.4.2, 11.2 of the.2009 edition);

1 Scope

GB/T 1555-2023 is the Chinese national standard on test methods for determining the orientation of a semiconductive single crystal, in the field of metallurgy. The /T suffix marks it as a recommended standard: it is not compulsory by itself, but it becomes binding as soon as a contract, a tender or a customer specification calls it up - which in practice is how most foreign buyers meet it. It was issued on 6 August 2023 by the State Administration for Market Regulation; Standardization Administration of China, and has been in force since 1 March 2024. Classification: ICS 77.040, CCS H21. This page is published from the official record of the standard held by the Chinese standards administration: the identification, the dates, the classification and the issuing body are taken from there. The clause text, the tables and the numeric limits are in the document itself, which is delivered complete in English translation.

This document describes methods for determining the crystal orientation of semiconductor single crystals using X-ray diffraction orientation and optical pattern orientation. This document is applicable to the determination of crystal orientation of semiconductor single crystals. The X-ray diffraction orientation method is suitable for the determination of silicon, germanium, gallium arsenide, silicon carbide, oxide. The surface orientation of semiconductor single crystal materials such as gallium, gallium nitride, indium antimonide and indium phosphide is roughly parallel to the low-index atomic plane; the light pattern orientation method is suitable for. It is used to determine the surface orientation of semiconductor single crystal materials such as silicon and germanium that are roughly parallel to the low-index atomic plane.

2 Normative reference documents

The contents of the following documents constitute essential provisions of this document through normative references in the text. Among them, the dated quotations. For undated referenced documents, only the version corresponding to that date applies to this document; for undated referenced documents, the latest version (including all amendments) applies to this document.

GB/T 2481.1 Detection and marking of abrasive grain size composition for bonded abrasive tools Part

3 Terms and definitions

The terms and definitions defined in GB/T 14264 apply to this document.

4 Test conditions

Ambient temperature. $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$; relative humidity. 20%~75%. 5 X-ray diffraction orientation method

5.1 Principles Single crystal atoms arranged in a three-dimensional periodic crystal

structure, the crystal can be regarded as a series of atoms arranged in the spatial interplanar spacing (d) Formed by parallel planes, when a beam of parallel monochromatic X-rays is incident on the plane, and the optical path difference between the X-rays shining on adjacent planes is When the wavelength is an integer (n) times, diffraction (reflection) will occur. Use a counter to detect diffraction lines, and determine the single crystal based on the position where they appear. The schematic diagram of the geometric reflection conditions of X-ray irradiation on a single crystal is shown in Figure

1. When the angle (θ) between the incident beam and the reflecting crystal plane, λ When the ray wavelength (λ), interplanar spacing (d) and diffraction order (n) satisfy formula (1) (Bragg's law), the X-ray diffraction beam intensity will reach Maximum value. At this time, the angle between the incident beam and the reflecting crystal plane is the Bragg angle (θ_B).