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

GB/T 1557-2018

Replacing GB/T 1557-2006

**Test method for determining interstitial oxygen content in
silicon by infrared absorption**

硅晶体中间隙氧含量的红外吸收测量方法

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Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009. This standard replaces GB/T 1557-2006 "Infrared Absorption Measurement Method for Interstitial Oxygen Content in Silicon Crystals", and GB/T 1557-2006 In contrast to the editorial changes, the main technical changes are as follows:

--- The scope has been added "When testing with low temperature infrared equipment, the oxygen content (atomic number) test range from $0.5 \times 10^{15} \text{cm}^{-3}$ to silicon The maximum solid solubility of interstitial oxygen (see Chapter 1).

--- Added GB/T 4059, GB/T 4060, GB/T 29057, GB/T 35306 to the normative references (see Chapter 2).

--- Added the test principle of low temperature infrared spectrometer in the method summary, and clarified "the low temperature Fourier transform infrared spectrometer test silicon For details of the oxygen content in single crystals, see GB/T 35306" (see Chapter 4).

--- Increase the impact of polycrystals, test environment, sample position, and test equipment on test results in interference factors (see 5.1, 5.8, 5.9, 5.10).

--- The transmission of the sample after subtracting the reference spectrum at 1600 cm^{-1} will be changed from " $100\% \pm 0.5\%$ " to " $100\% \pm 5\%$ " (see 5.4,.2006 edition 5.3).

--- Removed the effect of the absorption band at 1230 cm^{-1} on the test results when the concentration of precipitated oxygen was high (see.2006 edition 5.5).

6.3 micrometer" to "

6.3 thickness measuring equipment", modify the equipment accuracy to be greater than 0.01mm (see 6.3,.2006 edition) 6.3).

1 Scope

GB/T 1557-2018 is the Chinese national standard on test method for determining interstitial

oxygen content in silicon by infrared absorption, 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 17 September 2018 by the State Administration for Market Regulation; Standardization Administration of China, and has been in force since 1 June 2019. Classification: ICS 77.040, CCS H17. 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 standard specifies the method for determining the interstitial oxygen content in silicon single crystal by infrared spectroscopy. This standard is applicable to N-type silicon single crystals with room temperature resistivity greater than 0.1 $\Omega \cdot \text{cm}$ and P-type silicon with room temperature resistivity greater than 0.5 $\Omega \cdot \text{cm}$. Determination of interstitial oxygen content in single crystals. When testing with normal temperature infrared equipment, the oxygen content (atomic number) test range from $1 \times 10^{16} \text{ cm}^{-3}$ to silicon The maximum solid solubility of interstitial oxygen; the test range of oxygen content (atoms) from $0.5 \times 10^{15} \text{ cm}^{-3}$ to the middle of silicon when tested with low temperature infrared equipment The maximum solid solubility of the gap oxygen.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only dated versions apply to this article. Pieces. For undated references, the latest edition (including all amendments) applies to this document.

GB/T 4059 Silicon polycrystalline atmosphere zone molten phosphorus test method

GB/T 4060 silicon polycrystalline vacuum zone melting boron test method

GB/T 14264 semiconductor material terminology

GB/T 29057 Specification for evaluation of polycrystalline silicon rods by zone melt-drawing method and spectral analysis method

GB/T 35306 Determination of carbon and oxygen content in silicon single crystals by low-temperature Fourier transform infrared spectroscopy ASTM E131 molecular terminology (Standard terminology relating to molecular spectroscopy)

3 Terms and definitions

The following terms and definitions as defined in GB/T 14264 and ASTM E 131 apply to this document.

3.1 Dispersive infrared spectrometer dispersive infrared spectrophotometer An infrared

spectrometer that uses prisms or gratings as dispersive elements to acquire data from amplitude-wavenumber (or wavelength) spectra.

3.2 Fourier transform infrared spectrometer Fourier transform infrared spectrophotometer An interferometric spectrum obtained by an interferometer is converted into an amplitude-wavenumber (or wavelength) spectrum by Fourier transform to obtain data infrared spectrometer.

3.3 Reference spectrum reference spectrum The spectrum of the reference sample.

Note. When testing with a dual-beam spectrometer, the reference light path can be obtained by placing the reference sample directly into the sample path; in the single-beam spectrometer When testing, it can be calculated by subtracting the background spectrum from the spectrum of the reference sample obtained in the infrared light path.

3.4 Sample spectrum sample spectrum Test the spectrum of the sample.

Note. When testing with a dual-beam spectrometer, the test sample can be placed directly into the sample path to allow the reference path to be obtained; a single-beam spectrometer is used. In the test, the spectrum obtained by placing the test sample in the infrared light path is subtracted from the background spectrum and calculated.

6.4 Thermocouple - Millivoltmeter" to "

6.4 Temperature Measurement Equipment Thermocouple - Millivoltmeter or other suitable for test samples Room temperature equipment" (see 6.4,.2006 edition 6.4).

6.5 Humidity Test Equipment Hygrometer or other equipment suitable for testing the humidity of the environment" (see 6.5).

--- Change the thickness of the polished sheet in the equipment inspection from 0.065cm to 0.085cm (see 8.2.5,.2006 edition 8.2.5).

--- Modify "surface treatment" to "before testing, ensure that the surface of the sample is free of oxides", remove the "removal of the surface with HF corrosion Oxide" (see 8.3,.2006 edition 8.3).

--- Modify the "thickness measurement" to "measure the thickness of the sample to be tested and the reference sample. The difference in thickness between the centers should be less than $\pm 0.5\%$ " (See 8.4,.2006 edition 8.4).

--- The transmission spectrum is plotted as an informative appendix (see Appendix A,.2006 edition 8.7).

--- According to the test situation, the precision was modified (see Chapter 10, Chapter 11 of the.2006 edition). This standard is supported by the National Semiconductor Equipment and Materials Standardization Technical Committee (SAC/TC203) and National Semiconductor Equipment and Materials Standards. The Technical Subcommittee of the

Technical Committee (SAC/TC203/SC2) jointly proposed and managed. This standard was drafted. Xinte Energy Co., Ltd., Yanyan Semiconductor Materials Co., Ltd., Asia Silicon (Qinghai) Co., Ltd. Changnan Glass Silicone Material Co., Ltd., Longji Green Energy Technology Co., Ltd., Inner Mongolia Dunan Photovoltaic Technology Co., Ltd., Silicone Semiconductor Materials Institute, Beijing Heineng Sunshine New Energy Technology Co., Ltd. The main drafters of this standard. Yin Bo, Xia Jinjing, Qiu Yanmei, Liu Guoxia, Chai Huan, Zhao Jingjing, Liu Wenming, Yao Lizhong, Wang Haili, Deng Hao, Gao Ming, Zheng Lianji, Chen He, Shi Yu, Yang Xu, Xiao Zongjie. This standard replaces GB/T 1557-2006. The release of GB/T 1557-2006 has been.

---GB/T 1557-1989, GB/T 14143-1993. Infrared absorption measurement method for interstitial oxygen content in silicon crystal