

ICS 29.045  
CCS H80



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

**GB/T 1554-2009**

Replacing GB/T 1554-1995

---

**Testing method for crystallographic perfection of silicon by  
preferential etch techniques**

硅晶体完整性化学择优腐蚀检验方法

**Issued on: October 30, 2009**

**Implemented on: June 1, 2010**

---

**Issued by: General Administration of Quality Supervision, Inspection and  
Quarantine of the People's Republic of China;  
Standardization Administration of China**

## Table of Contents

- 1 Scope
- 2 Normative references
- 3 Terms and Definitions
- 4 Principle of the method
- 5 Disturbances
- 6 Reagents and materials

### Foreword

This standard replaces GB/T 1554-1995 "crystallographic perfection of silicon by preferential etch test methods." This standard compared with GB/T 1554-1995, the main changes are as follows:

- Added "The method is also applicable to a silicon single crystal film";
- Added "Terms and Definitions", "disturbing factors" chapter;
- Chapter 4 the last sentence "with the naked eye and optical microscope observation" to "visually combined with metallurgical microscope Observed";
- Original standard "in Table 1 four commonly used chemical polishing liquid formula," delete, chemical polishing liquid ratio was modified, deleted acid Recipes; and the content of the various reagents and materials to level modifications; adds weight ratios were 50% CrO<sub>3</sub> and 10% CrO
- 3 The ratio of the standard solution; an increase of crystal defects show common etchant comparative table; increase based SEMIMF1809-0704 Several international common non-chromium, chromium etching solution formulation, application and suitability classification comparative table;
- Chapter 9 of the original GB/T 1554-1995 "on (111) surface defects show" in the resistivity of not less than 0.2Ω · cm sample decay of Eclipse time changed 10min ~ 15min; "(100) surface defects show" in the sample and the resistivity of not less than 0.2Ω · cm of electrical Corrosion resistance of the sample time of less than 0.2Ω · cm's all changed 10min ~ 15min; increasing the (110) plane of indications; increase Added to the heavily doped samples show defects; increase the "m" shaped measuring method in selecting the measuring point defects observed in. Appendix A of this standard is an informative annex. This standard by the National Standardization Technical Committee of semiconductor equipment and materials proposed. This standard by the National

Standardization Technical Committee materials and equipment at the Technical Committee of semiconductor material. This standard was drafted. Emei Semiconductor Material Factory. The main drafters of this standard. He Lanying, Wang Yan, Zhang Huijian, Liu Yang. This standard replaces the standards previously issued as follows:

--- GB 1554-1979, GB/T 1554-1995.

--- GB 4057-1983. Crystallographic perfection of silicon by preferential etch test methods

## 1 Scope

GB/T 1554-2009 is the Chinese national standard on testing method for crystallographic perfection of silicon by preferential etch techniques, in the field of electrical engineering. 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 30 October 2009 by the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China; Standardization Administration of China, and has been in force since 1 June 2010. Classification: ICS 29.045, CCS H80. 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 test method preferential etching silicon crystal integrity. This standard applies to the crystal orientation of  $\langle 111 \rangle$ ,  $\langle 100 \rangle$  or  $\langle 110 \rangle$ , resistivity of  $10^{-3} \Omega \cdot \text{cm} \sim 10^4 \Omega \cdot \text{cm}$ , dislocation density in Monocrystalline silicon ingot or wafer inspection native defects  $10^5 \text{cm}^{-2}$  between  $0 \text{cm}^{-2} \sim$ . The method is also applied to Si wafers.

## 2 Normative references

The following documents contain provisions which, through reference in this standard and become the standard terms. For dated references, subsequent Amendments (not including errata content) or revisions do not apply to this standard, however, encourage the parties to the agreement are based on research Whether the latest versions of these documents. For undated reference documents, the latest versions apply to this standard.

GB/T 14264 semiconductor material terms YS/T 209 native silicon material defect map

## 3 Terms and Definitions

Terms and definitions GB/T 14264 in the provisions applicable to this standard.

## 4 Principle of the method

The display method using chemical preferential etching crystalline defects. Samples were preferred etch solution, in the defective position is etched shallow pit Or mound, at the macro may compose a certain pattern in the micro presented as discrete corrosion pits or mound. Combined with the use of visual inspection microscope They were observed.

## 5 Disturbances

5.1 etchant place for too long, there are volatile, precipitate phenomenon, affecting the corrosion effect.

5.2 Corrosion Corrosion time is too short, the dislocation was not obvious; etching time is too long, pitting corrosion and easy to expand, on the surface roughness, it is not clear background Clarity, features not obvious, dislocations are difficult to observe.

5.3 Corrosion corrosion, high temperature, the reaction speed is fast, and the reaction was easily attached to the surface of the sample affect the observed defects.

5.4 corrosion, the sample placed on the way the results of observations also has some influence, if corrosion resistance to hydrofluoric acid in the sample container upright, Etching bath may be generated in the surface of the sample, observe the effect of the defect.

## 6 Reagents and materials

6.1 trioxide, chemically pure.

6.2 hydrofluoric acid, chemically pure.

6.3 nitric acid, chemically pure.

6.4 acetic acid, chemically pure.

6.5 pure water resistivity greater than  $10\text{M}\Omega \cdot \text{cm}$  (25 °C). Chemical etching polishing liquid ratio of 6.6.  $\text{HF}:\text{HNO}_3 = 1. (3 \sim 5)$  (volume ratio).

6.7 chromic acid solution A. Weigh 500g of chromium trioxide in a beaker with water completely dissolved, transferred to 1000mL volumetric flask, diluted with water To the mark, and mix.