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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

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Surface chemical analysis - Secondary-ion mass spectrometry - Method for depth profiling of boron in silicon

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Table of Contents

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 of Standardization Documents"

Drafting.

This document uses the translation method equivalent to ISO 17560.2014 "Surface Chemical Analysis, Secondary Ion Mass Spectrometry, Depth Analysis Method for Boron in Silicon

law".

The Chinese documents that have consistent correspondence with the normatively cited international documents in this document are as follows.

---GB/T 20176-2006 Surface Chemical Analysis Secondary Ion Mass Spectrometry Determination of the Atomic Concentration of Boron in Silicon with Uniformly Doped Substances

Degree (ISO 14237.2000, IDT)

Introduction

This document is used for the quantitative depth analysis of boron in silicon using secondary-ion mass spectrometry (SIMS).

Formulate.

For quantitative depth profiling, calibration of element concentration and profiling depth is essential. ISO 14237.2010 stipulates in silicon

The method for determining the concentration of boron, the international standard is quoted in this document. The national standard GB/T 22461 [2] established the surface chemical analysis field

The vocabulary of domain conventional terms and spectroscopy terms, the related terms and vocabulary involved in this document are consistent with it.

This document is suitable for the in-depth analysis of boron in monocrystalline silicon, polycrystalline silicon, and amorphous silicon by secondary ion mass spectrometry, and the use of stylus

Surface profiler or optical interferometer for depth calibration.

Surface Chemical Analysis Secondary Ion Mass Spectrometry

Depth analysis method of boron in silicon

1 Scope

This document describes a method for deep analysis of boron in silicon using a sector magnetic field or a quadrupole secondary ion mass spectrometer, and the use of a stylus

Depth calibration method for surface profiler or optical interferometer.

This document is applicable to monocrystalline silicon, polycrystalline silicon or amorphous silicon with a boron atom concentration range of 1x1016atoms/cm3~1x1020atoms/cm3

For silicon samples, the sputtering crater depth is 50nm and above.

2 Normative references

The contents of the following documents constitute the indispensable clauses of this document through normative references in the text. Among them, dated quotations

Only the version corresponding to that date is applicable to this document; for undated reference documents, the latest version (including all amendments) is applicable to

This document.

ISO 14237.2010 Surface Chemical Analysis, Secondary Ion Mass Spectrometry, Determination of the Atomic Concentration of Boron in Silicon with a Uniformly Doped Material

facechemicalanalysis-Secondary-ionmassspectrometry-Determinationofboronatomicconcentra-

tioninsiliconusinguniformlydopedmaterials)

3 Symbols and abbreviations

The following symbols and abbreviations apply to this document.

The total atomic concentration of boron in the i test cycle of Ci, expressed by the number of atoms per unit volume (atoms/cm3)

C10i The atomic concentration of the boron 10 isotope in the ith test cycle, expressed by the number of atoms per unit volume (atoms/cm3)

C11i The atomic concentration of the boron 11 isotope in the ith test cycle, expressed by the number of atoms per unit volume (atoms/cm3)

di The depth of the i-th test cycle, expressed in micrometers (μm) or nanometers (nm)

dt The depth of the crater, expressed in micrometers (μm) or nanometers (nm)

I10i In the i-th cycle test, the ion intensity of the boron 10 isotope, expressed in counts/s

I11i In the ith test cycle, the ion intensity of the boron 11 isotope, expressed in counts/s

ISii In the i-th test cycle, the substrate silicon ion intensity, expressed in counts/s

J10i The ratio of the intensity of boron 10 isotope ion to silicon ion in the ith test cycle

J11i The ratio of the intensity of boron 11 isotope ion to silicon ion in the ith test cycle

J10BG The ratio of the average background value of boron 10 isotope ion to the intensity of silicon ion

J11BG The ratio of the average background value of boron 11 isotope ion to the intensity of silicon ion

N total number of test cycles

T total sputtering time, expressed in seconds (s)

tBi The start time of boron ion collection in the i-th test cycle, expressed in seconds (s)

deltatBi The duration of boron ion collection in each test cycle, expressed in seconds (s)

delta mass discrimination correction factor

lambda Optical interferometer measures the wavelength of light waves, expressed in micrometers (μm) or nanometers (nm)