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

Analyse chimique des surfaces — Spectrométrie de masse des ions secondaires — Dosage du bore dans le silicium par profilage d'épaisseur

Reference number
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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 201, *Surface chemical analysis*, Subcommittee SC 6, *Secondary ion mass spectrometry*.

Annex A of this International Standard is for information only.

This second edition cancels and replaces the first edition (ISO 17560:2002), which has been technically revised. The revision also includes editorial correction.

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Introduction

This International Standard was prepared for the quantitative depth profiling of boron in silicon by secondary-ion mass spectrometry (SIMS).

For quantitative depth profiling, calibration is necessary both for the concentration and the depth scales of the profile measured. A procedure for the determination of boron in silicon has been established as an International Standard, ISO 14237. Thus, the calibration of boron atomic concentration is performed by following ISO 14237.

This International Standard describes standard procedures for depth profiling of boron in single-crystal, poly-crystal, or amorphous silicon using SIMS and for depth scale calibration using stylus profilometry or optical interferometry.

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

1 Scope

This International Standard specifies a secondary-ion mass spectrometric method using magnetic-sector or quadrupole mass spectrometers for depth profiling of boron in silicon, and using stylus profilometry or optical interferometry for depth scale calibration. This method is applicable to single-crystal, polycrystal, or amorphous silicon specimens with boron atomic concentrations between 1×10^{16} atoms/cm^3 and 1×10^{20} atoms/cm^3, and to crater depths of 50 nm or deeper.

2 Normative reference

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 14237:2010, *Surface chemical analysis — Secondary-ion mass spectrometry — Determination of boron atomic concentration in silicon using uniformly doped materials*

3 Symbols and abbreviations

C_i total boron atomic concentration in measurement cycle *i*, expressed in atoms per cubic centimetre (atoms/cm^3)

C_i^{10} atomic concentration of the boron isotope with mass number 10 in measurement cycle *i*, expressed in atoms per cubic centimeter (atoms/cm^3)

C_i^{11} atomic concentration of the boron isotope with mass number 11 in measurement cycle *i*, expressed in atoms per cubic centimeter (atoms/cm^3)

d_i depth measured in measurement cycle *i*, expressed in micrometres (µm) or nanometers (nm)

d_t crater depth, expressed in micrometres (µm) or nanometres (nm)

I_i^{10} ion intensity of the boron isotope with mass number 10 in measurement cycle *i*, expressed in counts per second (counts/s)

I_i^{11} ion intensity of the boron isotope with mass number 11 in measurement cycle *i*, expressed in counts per second (counts/s)

I_i^{Si} ion intensity of silicon matrix in measurement cycle *i*, expressed in counts per second (counts/s)

J_i^{10} boron to silicon ion intensity ratio for the boron isotope with mass number 10 in measurement cycle *i*

J_i^{11} boron to silicon ion intensity ratio for the boron isotope with mass number 11 in measurement cycle *i*

J_{BG}^{10} mean background boron to silicon ion intensity ratio for the boron isotope with mass number 10 in measurement cycle *i*

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