

ICS 71.040.40

CCS G 04



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

GB/T 34174-2017

**Surface chemical analysis -- Proposed procedure for certifying
the retained areic dose in a working reference material
produced by ion implantation**

表面化学分析 工作参考物质中离子注入产生的驻留面剂量定值的推荐程序

(English Translation)

Issued on: September 7, 2017

Implemented on: August 1, 2018

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

Table of Contents

Foreword
Introduction
1 Scope
2 Normative references
3 Terms and definitions
4 Symbols and abbreviations
5 Concepts and Procedures
6 Requests
7 Fixed value
Appendix A (Informative) Ion Implantation
Appendix B (informative) ion implantation dose
Appendix C (informative) X-ray fluorescence spectrometry
Appendix D (informative) non-value two reference materials and their substitutes
Appendix E (Informative) Surface dose measurement uncertainty
References

Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009.

This standard uses the translation method identical with ISO/T R16268.2009 "surface chemical analysis of the work of reference material generated by ion implantation Recommended Protocol for Setting Resident Surface Dose".

This standard by the National Microbeam Analysis Standardization Technical Committee (SAC/TC38) and focal point.

This standard drafting unit. Institute of Chemistry, Chinese Academy of Sciences, Sinopec Petrochemical Institute of Science and Technology, National Nanoscience and Technology Center.

Introduction

This standard provides a summary of experience has not yet been verified as a complete program of recommended procedures to describe the work to obtain a reference value (WoRM), this WoRM is used for surface chemical quantitative analysis of a given wafer-like

solid material. Discussed here WoRM has ion-implanted some isotope of chemical elements (called analytes) larger in atomic number than Si, with the initial wafer selected by the analyst Choice or preparation. The recommended dosing regimen for resident analytes in WoRM was set.

The dosed surface area of the analyte in the ion-implanted WoRM wafer is measured by the resident surface agent of the same analyte ion-implanted on the wafer the amount is compared to a given value, and the wafer is a secondary reference material (SeRM), preferably set. Comparative measurement in two steps, the third reference substance and the two test techniques (wavelength dispersive X-ray fluorescence spectrometry (WD/XRF) and Sub-injection dose). As an intermediate reference material for the transfer of reference material (TrRM), also an ion implanted silicon wafer, WoRM is (non-equivalent) twin-injected (ie it is generated simultaneously with WoRM, but with different substrate types and resident doses at WoRM).

Its primary function is to avoid possible secondary excitation effects in direct WD/XRF measurements of WoRM; secondly in the presence of dresser WoRM is also allowed to be set when the amount is well below the WD/XRF measurement range.

The WoRM setting is part of the new concept and procedure for reference material characterization. In this concept, WoRM, TrRM and SeRM in the series of reference materials and their values have their own role. SeRM is the responsibility of analysts and reference material suppliers Between the transfer of material. This standard assumes that a suitable SeRM is available, describing part of the analyst's responsibility area. When getting one After SeRM, in order to carry on the comparative measurement of the dwell surface dose, the analyst needs to have the suitable ion implanter and suitable wavelength dispersion X Ray Fluorescence Spectrometer.

The wafer properties of WoRM are particularly suitable for semiconductor material analysis, but are not limited to this application. However, the choice of surface analysis techniques There are restrictions. Although the sample and WoRM may have the same analyte and substrate, the analyte may have different chemical states and may not the same depth distribution. With WoRM, the surface analysis technique of choice is insensitive to the chemical state of the analyte and allows for different depths Degree distribution to correct, in order to obtain meaningful results. This problem can be solved by using special reference materials in SIMS analysis.

WoRMs can be used for the depth profile of uniform, ion-implanted, diffused, stratified analytes when the appropriate surface analysis technique is selected measuring.

This standard mainly based on reference [1].

Surface chemical analysis of reference materials in the ion the recommended procedure for injecting the resulting resident face dose setting

1 Scope

For surface analysis of work reference material (WoRM) ion implantation atomic number greater than the analyte elements of silicon, the standard provides the procedure for setting the value of the resident face dose. WoRM is a uniform composition, the nominal diameter of not less than 50mm polishing (or similar grinding (Also referred to as a substrate) and has been ion-implanted with an isotope (also referred to as an analyte) of a certain chemical element not present on the substrate, which the nominal face dosage range is typically from 10^{16} to 10^{13} atoms/cm² (ie the most interesting range of semiconductor technologies). WoRM the surface dose of ion-implanted analyte in the wafer is determined by the presence of a resident surface agent that injects the same analyte as the secondary reference material (SeRM) the amount of comparison and set value.

This standard provides the concept of WoRM values and procedures for the information. There are also reference material requirements, more measured and real Description of the international setting. Ion implantation, ion implantation dosimetry, wavelength-dispersive X-ray fluorescence spectrometry and no-evidence-substitution when SeRM can not be obtained Supplementary materials, see Appendix A to Appendix D The sources and values of the uncertainties arising from the valuation process are in Appendix E.

2 Normative references

The following documents for the application of this document is essential. For dated references, only the dated version applies to this article Pieces. For undated references, the latest edition (including all amendments) applies to this document.

ISO 18115 surface chemical analysis vocabulary (Surfacechemicalanalysis-Vocabulary)

3 Terms and definitions

ISO 18115 defined and the following terms and definitions apply to this document.

Valuation

For a reference substance, according to a program value. To trace the value of a property to the available accurate unit to express the value of the property, and gives the uncertainty of the given value under given confidence.

Note: The term can be used at the same time to "confirm behavior" (ie, to value a program) and "certificate issue" to describe the value of the program.

Lower critical energy can lowercriticalenergy Kinetic energy of a beam of ions. Below this kinetic energy, the backscatter of vertically incident ions will exceed the specified hundred Sub-ratio.

Definitivemethod

The reference method is based on a valid, properly described theory to confirm that the resulting systematic error is relative to the end user's needs can be neglected. Method can measure a property, the measurement results are given directly in the form of basic units, or expressed by the exact mathematical formula Theoretical or chemical theory can be given in units that are closely related to the basic unit.

Note: The decisive method is a special method (see ISO Guide 30 [9]), which is particularly suitable for the setting of primary reference materials and allows for the study of certain properties directly Given in the form of basic units of measurement or in closely related units of basic units of measurement. For example, a high purity element gas phase Deposited on the sheet, and then measured by direct weighing method.