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Surface chemical analysis - Secondary ion mass spectrometry - Calibration of the mass scale for a time-of-flight secondary ion mass spectrometer

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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 13084.2018 ``Surface Chemical Analysis Secondary Ion Mass Spectrometry Time of Flight Secondary Ion

Mass spectrometer mass standard calibration".

Introduction

Secondary ion mass spectrometry (SIMS) is a method used to analyze organic and molecular surfaces

Powerful technology. In the past ten years, secondary ion mass spectrometry instruments have been significantly improved, so modern instruments have a very high weight.

Refolding and stability [2], and the need to determine the chemical composition of complex molecules by accurately measuring the mass of secondary ions is increasing. because

This does this and distinguishes relative molecules that contain different chemical components but have the same nominal mass (rounded to the nearest integer mass).

Quality accuracy is an important parameter. A relative mass accuracy better than 10x10-5 is required to distinguish the parent ion with a total mass of up to 1000u

C2H4 (28.03130u) and Si (27.97692u) and the parent ion with a total mass of up to 300u CH2 (14.01565u) and

N (14.00307u). However, in a recent inter-laboratory study [3], it was found that the average mass accuracy of the fragments was 1.5x10-4.It's obvious

It is worse than the relative mass accuracy required to clearly identify ions. Detailed research shows that the key factors that reduce accuracy include secondary

Extrapolation of ion's wide kinetic energy distribution, non-optimized instrument parameters and mass scale calibration.

This document describes a simple method and procedure for optimizing instrument parameters using local materials to ensure that there is a selectable uncertainty

Achieve accurate calibration of quality standards within the scope.

Surface Chemical Analysis Secondary Ion Mass Spectrometry

Mass standard calibration of time-of-flight secondary ion mass spectrometer

1 Scope

This document describes a time-of-flight secondary ion mass spectrometry (SIMS) instrument used to optimize the mass calibration accuracy of general analytical purposes.

Degree method. This document only applies to time-of-flight instruments, but is not limited to any specific instrument design. This document provides an overview of some instruments

Guidelines for optimizing the parameters of the instrument, these parameters can be optimized using this program, and it also provides a calibration standard suitable for obtaining the best quality accuracy.

The general peak type of the degree.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

There are no terms and definitions that need to be defined in this document.

The database of standardized terminology used by ISO and IEC is maintained at the following website.

4 Symbols and abbreviations

The following symbols and abbreviations apply to this document.

4.1 Symbols

m. quality to be tested

m1.Calibration quality 1

m2.Calibration quality 2

M. mass (u)

Mo. Peak center (u)

deltaM. mass accuracy (u)

MP. The mass of the measured peak (u)

MT. true quality (u)

U(m). The uncertainty of the mass m produced by calibration

U1.m1 Uncertainty of accurate mass measurement

U2.m2 Uncertainty of accurate mass measurement

U0.Average uncertainty of accurate mass measurement

VR. reflector or receiving voltage (V)

W. relative mass accuracy

x. number of carbon atoms

y. number of hydrogen atoms

Go. zoom item

alpha. Asymmetric term

sigma(deltaM). The standard deviation of the mass accuracy of multiple peaks

sigmaM. The average value of the standard deviation of deltaM for each of the four CxHy series with 4, 6, 7 and 8 carbon atoms