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

GB/T 32998-2016

**Surface chemical analysis -- Auger electron spectroscopy --
Reporting of methods used for charge control and charge
correction**

表面化学分析 俄歇电子能谱 荷电控制与校正方法报告的规范要求

(English Translation)

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Foreword

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

This standard uses the translation method equivalent to ISO 29081.:2010 "Surface Chemistry Analysis Auger Electron Spectroscopy Charge Control and Correction Legal reporting requirements ".

And the normative reference in this standard international documents are consistent with the relationship between China's documents are as follows.

Surface chemistry analysis vocabulary (ISO 18115.:2001, IDT);

GB/T 29731-2013 Surface Chemistry Analysis High Resolution Auger Electron Spectrometer Element and Chemical State Analysis Energy Metals Calibration (ISO 17974.:2002, MOD);

GB/T 29732-2013 Surface Chemistry Analysis Medium Resolution Auger Electron Spectrometer Elemental Analysis Energy Standard Calibration (ISO 17973.:2002, MOD).

This standard is proposed by the National Microparraph Analysis Standardization Technical Committee (SAC/TC38).

The drafting of this standard. School of Physics, University of Science and Technology of China.

Introduction

Auger electron spectroscopy (AES) is widely used in the surface characterization of materials. The measured Auger electron peak energy is compared with the manual value. Other samples contain different elements other than hydrogen and helium. Although X-ray irradiated samples (X-ray photoelectron spectroscopy) will also be observed in Russia the electrons of the Auger electrons mentioned in this paper are measured under electron irradiation. Since the electron beam can be focused to nearly 10 nm the Auger electron spectroscopy is an important research tool for characterizing nanostructures and microscopic surface features. The energy of the peak, linear analysis, often available the information contained in the sample is even the chemical state of the element being detected [43]. Therefore, the reliable judgment of the elements contained in the sample is required (See ISO 17973 and ISO 17974 for details).

During the Auger spectrum measurement, the surface potential of the insulating sample is changed due to the accumulation of charge in the sample surface and the near surface region. These accumulated charges can alter the energy of the Auger electrons, especially when the negative surface potential enables the movement of the Auger spectrum beyond the electronic analyzer when the energy interval is selected, the characterization of the element (chemical state) is complicated. The accumulation of surface potential can also change the area of action of the electron beam the beamlets move significantly on the sample surface, even deviating from the selected analysis area. If the metal sample is not grounded, a similar charge will also appear. example such as small metal particles into the insulating substrate may lead to charge accumulation.

The secondary electron yield determines the positive and negative surface potential. In some cases, changes in energy and location of these two factors may cause no change. Stable feedback system, resulting in the collection of Auger electron spectroscopy is almost impossible. In addition to the Auger peak intensity, the energy changes, the incident electron beam or Diffusion due to the presence of an electric field in the surface area of the sample may also directly alter the sample surface component (sample damage).

A number of methods have been developed to control and minimize the charge effect in the Auger electron spectroscopy. The application of a particular method depends on the use the details of the equipment, the shape and size of the sample to be measured, the sample morphology and composition, and the information to be collected. Although the accumulation of surface charge makes the analysis complex Hybrid, but in some cases, the use of appropriate samples can also provide some information.

The amount of induced charge in the near surface region and its distribution on the surface of the sample, depending on the experimental conditions can be determined by many factors, these factors and the nature of the sample, spectrometer. Charge accumulation has a three-dimensional feature [1]. along the sample surface and then extended to the material

inside. Charge accumulation will also be appear in the electrons can reach the depth of the sample within the two-phase boundary or interface area. Due to incident electrons, secondary electrons, heating and other factors induced charge trapping, chemical changes, component diffusion or volatilization, and the charge accumulation of some samples will change over time. These samples may be from will not reach steady potential.

In the case of the Auger electron spectrum, there is currently no pervasive method to control or correct the charge [2,3]. This standard specifies the number according to the collection must be recorded when the method of charge control, and/or in the insulation sample data analysis records the charge calibration method and other information. In the attached the general method of charging control described in A is very useful in practical applications. In the actual operation of the selected charge to control the specific party the method depends on the type of sample (powder, film or thick sample), the nature of the instrument, the size of the sample, and the surface of the sample subject to specific treatment influence level. In order to facilitate the use of analysts, according to the simplicity of the application of the general charge control method for a summary list.

There are two main areas of application for this standard. First, in order to assess the reproduction of insulating material measurement data to ensure that the measurement of similar materials the method of comparability, charge control and/or charge calibration should be included in the measurement report of the AES spectrum; second, compliance with this standard will the published AES spectrum enables other analysts to use it with confidence.

Surface chemistry analysis Auger electron spectroscopy Specification of charge control and calibration method reporting

1 Scope

This standard specifies the minimum information required to describe the charge control method in the Auger electron spectroscopy of electronically energized insulating samples, which the information is also reported in the analysis results. Refer to Appendix A for available AES analysis before or during analysis of charge control law. Table A.1 summarizes the various approaches and approaches and arranges them according to the simplicity of the method. Some of the methods in Table A.1 are for most instruments. Devices are available, some require special hardware, and some may involve reloading or variations of the sample.

2 Normative reference documents

The following documents are indispensable for the application of this document. For dated references, only the dated edition applies to this article. For undated references, the latest edition (including all modifications) applies to this document.

ISO 17973 Surface chemistry analysis Medium resolution Auger electron spectrometer
 Elemental analysis Energy standard calibration (Surface
 chemicalanalysis-Medium-resolutionAugerelectronspectrometers-Calibration
 ofenergyscalesfor elementalanalysis ISO 17974 Surface Chemistry Analysis High
 Resolution Auger Electron Spectrometer Element and Chemical State Analysis Energy
 Standard Calibration (Surface
 chemicalanalysis-High-resolutionAugerelectronspectrometers-Calibration of
 energyscalesforel-ementalandchemical-stateanalysis ISO 18115 Surface chemistry
 analysis Vocabulary (Surfacechemicalanalysis-Vocabulary)

3 Terms and definitions

The terms and definitions defined in ISO 18115 apply to this document. The

4 Symbols and abbreviations

The following symbols and abbreviations apply to this document.

AES Auger Electron Spectroscopy (Augerelectronspectroscopy) E_p electron energy, in units
 of electrons (keV) E_p (max) The energy at the maximum secondary electron output E_{0p1}
 secondary electrons output to rise to more than 1 when the energy E_{0p2} secondary
 electrons output fell to less than 1 when the energy E_{cp2} The incident electron range is
 approximately equal to the energy at the maximum depth of escape of the secondary
 electrons FIB focused ion beam (focusedionbeam) FWHM half-value full width
 (fulwidthathalfmaximum), the unit is the electronic volt (eV) I_p incident electron current is
 the secondary electron current j_p The current density of the incident electron beam on the
 surface of the sample