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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 19500-2025

Replacing GB/T 19500-2004

Surface chemical analysis - General rules for X-ray photoelectron spectroscopic analysis method

表面化学分析 X射线光电子能谱分析方法通则

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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 for standardization documents" Drafting.

This document replaces GB/T 19500-2004 "General rules for X-ray photoelectron

spectroscopy analysis methods" and is consistent with GB/T 19500-2004.

In addition to structural adjustments and editorial changes, the main technical changes are as follows.

a) The referenced documents in "Normative References" have been changed (see Chapter 2);

b) Added references to "Terms and Definitions" and some terms and definitions (see Chapter 3, 3.1, 3.2, 3.4, 3.6, 3.7, 3.8, 3.9, 3.11, 3.19, 3.20, 3.25, 3.26, 3.27, 3.28, 3.32, 3.37, 3.38, 3.39 and 3.40);

c) Added a chapter on "Symbols and Abbreviations" (see Chapter 4);

d) The chapter "Principles of the Method" was modified (see Chapter 5, Chapter 4 of the 2004 edition);

e) The overview and Figure 1 in the item "Instrument composition" have been changed (see 6.1.1, 5.1 of the 2004 edition);

f) The description of the entry "X-ray excitation source" was changed, and Table 1 and the description of the synchrotron radiation source were added (see 6.1.2, 2004 edition). 5.1.1);

g) Added the entry "Electronic lens system" (see 6.1.3);

h) Change the description of the entry "Electronic detector" (see 6.1.5, 5.1.3 of the 2004 edition);

i) The description of the entry "Charge Neutralizer" has been changed (see 6.1.7, 5.1.6 of the 2004 edition);

j) The name of the item "Data Acquisition and Processing System" was changed and the content was added (see 6.1.9, 5.1.4 of the 2004 edition);

k) Changed the referenced documents in the "Instrument Performance" item and added anode power, signal intensity and energy resolution, charge neutralization, Ion sputtering, etc. (see 6.2, 5.2 of the 2004 edition);

l) The name and content of the chapter "Specimens" have been changed (see Chapter 7, Chapter 6 of the 2004 edition);

m) Added references to the chapter "Analysis Steps" (see 8.1);

n) Modified and added the overview and content of the item "Analysis Preparation" (see 8.2, 7.1 of the 2004 edition);

o) Changed the description of the items "Charge correction" and "Spectrometer energy resolution" (see 8.3.1 and 8.3.2, 7.2.1 and 7.2.2);

p) Added the items "Imaging and Micro-area Analysis", "Depth Profiling" and "Data

Processing and Analysis" (see 8.6, 8.7 and 8.8);

q) The title and content of the chapter "Results Reporting" have been changed (see Chapter 9, Chapter 8 of the 2004 edition).

Please note that some of the contents of this document may involve patents. The issuing organization of this document does not assume the responsibility for identifying patents.

This document is proposed and coordinated by the National Technical Committee for Standardization of Surface Chemistry Analysis (SAC/TC608).

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The previous versions of this document and the documents it replaces are as follows.

- First issued in 2004 as GB/T 19500-2004;

- This is the first revision.

Introduction

X-ray photoelectron spectroscopy (XPS) is an experimental technique widely used in materials science and surface chemistry.

The beam irradiates the material and measures the kinetic energy and number of photoelectrons escaping from the top of the material being analyzed within a depth of 0nm~10nm to obtain Characteristic XPS spectra of each element. The laboratory uses a typical X-ray excitation source, which can detect all elements except hydrogen and helium (original The detection limits of most elements can be within a few thousandths of an ppm range.

The XPS method has low destructiveness to the test sample and high surface sensitivity, and can be used to analyze the chemical composition and electronic structure of the material surface.

XPS imaging and micro-area analysis technology have high The XPS depth analysis can obtain the element distribution and chemical state of the surface of the material at the micron level.

Qualitative and quantitative results at different nanometer depths below the surface.

This document describes the basic specifications and method flow of XPS analysis technology, including instrument structure and function, pre-experimental preparation, The experimental steps and post-experimental data processing involve the preparation and

installation of XPS samples, the selection of instrument parameters and data Acquisition, spectrum processing and qualitative and quantitative analysis, as well as the preparation of inspection and testing reports. Following this document and process can ensure the XPS experiment The accuracy, reliability and comparability of the results provide powerful data for obtaining the true electronic structure and chemical composition information of the material surface. support.

From basic research to industrial applications, the development of XPS analysis technology has enabled scientists to gain a deeper understanding of the surface characteristics of materials.

It helps the research of surface chemistry and materials science, and continues to play an important role in the development of new materials and new technologies.

Surface chemical analysis X-ray photoelectron spectroscopy General principles of the method

1 Scope

This document specifies the general requirements for a general surface analysis method using X-ray photoelectron spectroscopy (XPS).

This document defines terminology related to XPS surface chemistry analysis.

This document applies to X-ray photoelectron spectrometers.

2 Normative references

GB/T 22461.1

GB/T 25184

GB/T 28892

GB/T 30704

3 Terms and Definitions

The terms and definitions defined in GB/T 22461.1 and the following apply to this document.

3.1 surface

The interface between a condensed phase and a gas phase, vapor, or free space.

Note 1 to entry. The interface between the solid and gas phases is called a surface.

NOTE 2 For the purpose of surface analysis, it is recommended to distinguish between the