

ICS 71.040.40
CCS G 04



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

GB/T 45769-2025

**Surface chemical analysis - X-ray photoelectron spectroscopy -
Estimating and reporting detection limits for elements in
homogeneous materials**

表面化学分析 X射线光电子能谱 均匀材料中元素检测限的评估和报告
(English Translation)

Issued on: June 30, 2025

Implemented on: January 1, 2026

**Issued by: State Administration for Market Regulation, China National
Standardization Administration**

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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 is equivalent to ISO 19668:2017 "Surface chemical analysis - X-ray photoelectron spectroscopy - Detection limits of elements in homogeneous materials" Assessment and Reporting.

Introduction

X-ray photoelectron spectroscopy is a widely used technique for measuring the surface composition of materials.

In either case, it is important to know the lowest concentration of the element that can be

detected under the measurement conditions.

This can provide confidence intervals for the results, or provide an understanding of how to change the measurement conditions to achieve the required detection limit.

This document provides a method to directly calculate the detection limit based on XPS experimental data under conventional analytical conditions;

The uncertainty assessment method for the XPS detection limit is described in Appendix A and the definition of the XPS detection limit is described in Appendix B. Example data and calculations are given in Appendix C.

Appendix D contains available conversions and references describing how to evaluate X-ray diffraction patterns based solely on data from reference samples (e.g., clean silver sheets).

Detection limit of the X-ray photoelectron spectrometer.

The calculation method of detection limit is very important. XPS technology is often used to detect low concentration elements on the surface of materials.

In addition, if a specific detection limit is required, the analyst can calculate the the acquisition time required to reach the specified detection limit.

Surface chemical analysis X-ray photoelectron spectroscopy uniformity Evaluation and reporting of element detection limits in materials

1 Scope

This document describes the evaluation of elemental detection in X-ray photoelectron spectroscopy (XPS) data obtained from specific samples under routine analytical conditions.

This document is applicable to uniform materials and is not applicable to materials with uneven element depth distribution within the XPS information depth.

Applicable.

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document.

For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to this document.

Note: GB/T 22461.1-2023 Surface chemical analysis vocabulary Part 1: General terms and

spectroscopic terms (ISO 18115-1:2013, IDT) ysis-Vocabulary-Part 2:
Termsusedinscanning-probemicroscopy) Note. GB/T 22461.2-2023 Surface chemical analysis
vocabulary Part 2: Scanning probe microscopy terminology (ISO 18115-2:2013, MOD)

3 Terms and Definitions

For the purposes of this document, the terms and definitions defined in ISO 18115-1 and ISO 18115-2 and the following apply.

reference element the peak area and relative content of the chemical elements present in the sample can be detected.

specifiedelement

The chemical element for which the detection limit calculation is to be performed.

4 Symbols and abbreviations

The following symbols and abbreviations apply to this document.

ofelementi,countsorcps) summed intensity, counts or cps)