
**Surface chemical analysis — X-ray
photoelectron spectroscopy —
Guidelines for analysis**

*Analyse chimique des surfaces — Spectroscopie de photoélectrons par
rayons X — Lignes directrices pour l'analyse*

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

ISO 10810:2019

<https://standards.iteh.ai/catalog/standards/iso/948ecce7-92bd-4d98-bac4-325d234916d5/iso-10810-2019>



iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

ISO 10810:2019

<https://standards.iteh.ai/catalog/standards/iso/948ecee7-92bd-4d98-bac4-325d234916d5/iso-10810-2019>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2019

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Symbols and abbreviations	1
5 Overview of sample analysis	2
6 Specimen characterization	4
6.1 General	4
6.2 Specimen forms	5
6.2.1 General	5
6.2.2 Single crystal	5
6.2.3 Adsorbed or segregated layers, films and residues	5
6.2.4 Interfaces and multilayered samples	6
6.2.5 Non-porous	6
6.2.6 Porous	6
6.2.7 Powder	6
6.2.8 Fibres and textiles	6
6.2.9 Internal interface	6
6.3 Material types	6
6.3.1 General	6
6.3.2 Metals and alloys	6
6.3.3 Polymers	7
6.3.4 Semiconductors	7
6.3.5 Magnetic materials	7
6.3.6 Ceramics	7
6.3.7 Catalysts	7
6.3.8 Glass and insulators	7
6.3.9 Biological	7
6.3.10 Nanoparticles	7
6.4 Handling and mounting of specimens	7
6.5 Specimen treatments	8
6.5.1 General	8
6.5.2 Heating and cooling	8
6.5.3 Scraping and fracture	8
6.5.4 Ion bombardment for analysing thin films	8
6.5.5 Exposure to gases and liquids	8
7 Instrument characterization^[8]	8
7.1 General	8
7.2 Instrument checks	9
7.2.1 System health check ^[9]	9
7.2.2 Mechanical	9
7.2.3 Sample holder	9
7.2.4 Vacuum	9
7.3 Instrument calibration	10
7.3.1 Calibration of binding energy scale	10
7.3.2 Intensity repeatability and intensity/energy response function (IERF)	11
7.3.3 Linearity of intensity scale test	12
7.3.4 Lateral resolution	13
7.3.5 Depth resolution ^{[21][22]}	13
7.3.6 Charge correction	16
7.4 Instrument set-up	16

	7.4.1	Optimum settings.....	16
	7.4.2	System configuration	17
8		The wide-scan spectrum.....	17
	8.1	Data acquisition	17
	8.1.1	General.....	17
	8.1.2	Sample loading.....	18
	8.1.3	Energy resolution.....	18
	8.1.4	Energy range, step size and acquisition mode.....	18
	8.1.5	X-ray source and conditions.....	18
	8.1.6	Charge correction.....	19
	8.1.7	Spectrum acquisition	19
	8.1.8	X-ray degradation.....	19
	8.1.9	Thin surface layer.....	19
	8.2	Data analysis	19
	8.2.1	Calibration of the binding energy scale.....	19
	8.2.2	Peak table.....	20
	8.2.3	Quantification.....	20
	8.2.4	Assessment of the composition employing the Tougaard extrinsic background ^[42]	21
	8.2.5	Requirement for narrow scans.....	21
9		The narrow scan	21
	9.1	General.....	21
	9.2	Data acquisition	21
	9.2.1	Instrument settings.....	21
	9.2.2	Choice of region	21
	9.3	Data analysis	22
	9.3.1	Element identification.....	22
	9.3.2	Chemical-state identification.....	22
	9.3.3	Quantification.....	23
10		Test report.....	26
Bibliography		ISO 10810:2019	28

<https://standards.iteh.ai/catalog/standards/iso/948ecce7-92bd-4d98-bac4-325d234916d5/iso-10810-2019>

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 201, *Surface chemical analysis*, Subcommittee SC 7, *Electron spectroscopies*.

This second edition cancels and replaces the first edition (ISO 10810:2010), which has been technically revised. The main changes to the previous edition are as follows:

- [Table 3](#): semiconductor wafer added as a specimen form;
- [6.2.7](#): paragraph replaced to reflect modern practice;
- [6.3.10](#): nanoparticles added as a material type;
- [Clause 8](#) and the flow chart in [Figure 6](#) have been thoroughly revised to improve clarity. The cells in the flow chart now contain references to the appropriate subclause within [Clause 8](#);
- [8.2.1](#): it is now pointed out that the use of the C 1s peak provides only an approximate binding energy reference;
- [9.3.3.3](#): mention has been made of the use of ionised clusters of inert gas atoms for depth profiling.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

X-ray photoelectron spectroscopy (XPS) is used extensively for the surface (1 nm to 10 nm) analysis of materials. Elements in the sample (with the exception of hydrogen and helium) are identified from comparisons of the measured binding energies of their core levels with tabulations of those energies for the different elements. Their chemical states may be determined from shifts in peak positions and other parameters compared with the data for that element in its pure elemental state. Information on the quantities of such elements can be derived from the measured intensities of photoelectron peaks. Calculation of the quantities of the constituent chemical species present in the surface layer studied (outer 1 nm to 10 nm) may then be made using formulae and relative-sensitivity factors provided by the spectrometer manufacturer or locally measured relative-sensitivity factors and appropriate software.

This guidance document is intended to aid the operators of X-ray photoelectron spectrometers in their analysis of the surfaces (outer 1 nm to 10 nm) of typical samples.

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[ISO 10810:2019](https://standards.iteh.ai/catalog/standards/iso/948ecce7-92bd-4d98-bac4-325d234916d5/iso-10810-2019)

<https://standards.iteh.ai/catalog/standards/iso/948ecce7-92bd-4d98-bac4-325d234916d5/iso-10810-2019>