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**Surface chemical analysis — Near  
real-time information from the X-ray  
photoelectron spectroscopy survey  
scan — Rules for identification of, and  
correction for, surface contamination  
by carbon-containing compounds**

*Analyse chimique des surfaces — Informations en temps quasi réel  
issues du balayage d'ensemble par spectroscopie photoélectronique  
à rayonnement X (XPS) — Règles portant sur l'identification et  
la correction d'une contamination des surfaces par des composés  
contenant du carbone*



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## 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](http://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](http://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](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 201, *Surface chemical analysis*, Subcommittee SC 3, *Data management and treatment*.

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](http://www.iso.org/members.html).

## Introduction

The basis of X-ray photoelectron spectroscopy is irradiation of a sample surface by soft X-rays and examination of the excited emission in the form of photo- and Auger electrons. In its most widely used mode the X-ray flux is of low intensity and spread over a large area. Thus, the technique is generally regarded as one of the least destructive of the available 'beam' techniques used for analysis of materials' surfaces. The increasingly wide use of the technique makes the development of rule sets, that enable accurate information retrieval, highly important and this document helps to meet this need.

In many cases the surface for which a composition is desired will have accreted a film of contamination, frequently organic in nature and arising from adsorption of molecules from the atmosphere, from the exposure to a working or test environment, or from the spectrometer itself. This film attenuates the different regions of the spectrum to a different extent, depending on the kinetic energy of the electron emitted in that region. Thus correction and removal of this influence is necessary for the desired surface composition of the substrate to be achieved. The procedure to be described enables recognition of the presence of carbon-containing contamination, an estimate of its thickness, and the removal of its influence on the measured surface composition. It is thus an integral part of data reduction in quantitative evaluation of the XPS Survey Scan. This could be automated within a data system and would be an essential first step in provision of a means for automatic retrieval of information from the survey scan for a number of technologies dependent on surface analysis.

All procedures described are intended to be based only on an XPS survey scan obtained in the fashion recommended in the conclusions of the IUVSTA Workshops 22<sup>[9]</sup> and 34<sup>[10]</sup>; they can be carried out in a manner which does not require intervention by an expert spectroscopist and could be adopted in an automated data system.



# Surface chemical analysis — Near real-time information from the X-ray photoelectron spectroscopy survey scan — Rules for identification of, and correction for, surface contamination by carbon-containing compounds

## 1 Scope

This document is provided to assist in the surface analysis of thin films on materials which are not thought to contain carbon compounds as intended components but for which a C1s peak is observed in the survey spectrum. The films can be those generated on metals and alloys by aerobic or electrochemical oxidation or be those deposited on inert substrates. The procedure described is not suitable for discontinuous deposits of particles on a substrate. With this exception, a simple procedure is provided for identifying the C1s signal from carbon-containing surface contamination. When the C1s peak is identified as arising from an adventitious over-layer the composition derived from the survey spectrum can be corrected for its influence. Recommended procedures are provided in the form of simple Rules structured in the 'If - Then' format with the intention that the information they embody might be utilised by automated procedures in data-systems. The rules provided utilize only information retrieved from the XPS survey scan.

## 2 Normative references

There are no normative references in this document.

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

### 3.1 region

part of the fully accessible photo-excited spectrum chosen for acquisition in a detail, i.e. 'narrow', scan

Note 1 to entry: The region may be chosen because it contains a major or minor peak of a given element or to represent the shape or slope of a background within that energy range.

### 3.2 survey scan

scan or series of scans across the major part of the photo-electron spectrum excited by a given X-ray source

### 3.3 goal

achievement of an objective which is part of the process of the interpretation of a spectrum

Note 1 to entry: For example, the completion of a quantitative analysis can be thought of as the achievement of a goal.