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Surface chemical analysis — Sample handling, preparation and mounting —

Part 1: Documenting and reporting the handling of specimens prior to analysis

Analyse chimique des surfaces — Manipulation, préparation et montage des échantillons —

Partie 1: Documentation et notification des données de manipulation des échantillons avant analyse

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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 document 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).

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This document was prepared by Technical Committee ISO/TC 201, *Surface Chemical Analysis*, Subcommittee SC 2, *General procedures*.

This first edition of ISO 20579-1 cancels and replaces ISO 18117:2009.

A list of all parts in the ISO 20579 series can be found on the ISO website.

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.

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Introduction

0.1 Introduction to the ISO 20579 series

The handling and preparation of samples for surface analysis can physically or chemically alter the surface. Therefore, reliable surface analysis depends upon knowing the analysis objectives and knowledge of the sample history including aspects of how the sample has been prepared, stored, processed, and handled prior to and during analysis. The ISO 20579 series describes the information that needs to be collected and included as part of the sample history (sample provenance information). Both ISO 20579-1 and ISO 20579-2 describe information to be recorded regarding sample handling, and storage. This document describes information needed regarding sample selection, handling, and preparation when requesting surface analysis. ISO 20579-2 provides information about sample handling, preparation, mounting and processing to be reported by an analyst. ISO 20579-3 and ISO 20579-4 focus on specific handling and reporting needs associated with nanomaterials (ISO 20579-4) and biomaterials (ISO 20579-3). Each part of this series can be used independently of the other parts, although the general reporting requirements described in this document (ISO 20579-1) and in ISO 20579-2[1] are applicable to a wide range of materials and are not reproduced in ISO 20579-3 and ISO 20579-4.

Although primarily prepared for the surface-analysis techniques of Auger-electron spectroscopy (AES), X-ray photoelectron spectroscopy (XPS), and secondary-ion mass spectrometry (SIMS), the methods described in this document are also applicable to many other surface-sensitive analytical techniques such as ion-scattering spectrometry, scanning probe microscopy, low-energy electron diffraction and electron energy-loss spectroscopy, where specimen handling can influence surface-sensitive measurements. AES, XPS, and SIMS are sensitive to surface layers that are typically a few nanometers thick. Such thin layers can be subject to severe perturbations caused by specimen handling or surface treatments that can be necessary prior to introduction into the analytical chamber. Proper handling and preparation of specimens is particularly critical for dependable analysis. Improper handling of specimens can result in alteration of the surface composition and unreliable data.[2][3]

0.2 Introduction to this document (ISO 20579-1)

This document is intended for the specimen owner or someone requesting surface analytical services. It describes the minimum information regarding the analysis objectives and sample preparation that an analyst needs to know to determine if and how the desired information can be obtained. This information becomes part of sample provenance record to help validate the reliability and usefulness of data obtained from surface-analysis methods.[4]

Surface analysis methods measure the outer atomic layers of a specimen surface which can be inadvertently altered by inappropriate handling or preparation. Therefore, the degree of care and cleanliness required by surface-sensitive analytical techniques is usually much greater than for many other analysis methods. Appropriate careful sample selection, preparation and storage are essential for reliable surface analysis and the documentation and reporting of this information is critical to the ability to assess the validity of surface analysis information.

Although the categories of needed reporting are similar for all specimens, the details of the required sample handling can vary depending on the nature of the sample and analysis objectives. Annexes to this document and references therein provide background information useful to assist in identification of the necessary sample preparation, handling, storage, and transport requirements that maximize the ability for obtaining the desired information.

Annex A identifies three categories of analysis objectives and provides an overview of the challenges associated with sample preparation for surface analysis in the context of each desired objective. Included is a table summarizing relevant sample handling methods and types of specimen containers needed for the three types of analysis objectives and is intended to help those requiring surface analysis. Annex B discusses common sources of contamination and issues along with methods to minimize contamination related to sample handling. Annex C discusses topics related to sample storage and transportation.

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Surface chemical analysis — Sample handling, preparation and mounting —

Part 1: Documenting and reporting the handling of specimens prior to analysis

1 Scope

This document identifies the information needed to ensure that a sample has been selected, processed, handled, and stored in a manner consistent with the analysis objectives, and to ensure the reliability and reproducibility of the surface analyses. Such information is also an important component of sample data record books, datasheets, certificates of analysis, reports, and other publications. This information is in addition to other details associated with the specimens to be analysed, such as source/synthesis information, processing history, and other characterizations that naturally become part of the data record (sometimes referred to as provenance information) regarding the origin of the sample and any changes to its original form.

This document also includes normative annexes as an aid to understanding the special sample handling techniques and storage requirements of surface chemical analysis techniques, particularly: Auger electron spectroscopy (AES), secondary ion mass spectrometry (SIMS), and X-ray photoelectron spectroscopy (XPS). The information presented can also be applicable for other analytical techniques, such as total reflection X-ray fluorescence spectroscopy (TXRF), that is sensitive to surface composition, and scanning probe microscopy (SPM), that is sensitive to surface morphology.

This document does not define the nature of instrumentation or operating procedures needed to ensure that the analytical measurements described have been appropriately conducted.

2 Normative references

The following documents are referred to in the text in such a way that some of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 18115-1, *Surface chemical analysis — Vocabulary — Part 1: General terms and terms used in spectroscopy*

ISO 18115-2, *Surface chemical analysis — Vocabulary — Part 2: Terms used in scanning-probe microscopy*

3 Terms and definitions

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

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

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