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Surface chemical analysis — Sample handling, preparation and mounting —

Part 3: Biomaterials

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

Partie 3: Biomatériaux

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Foreword

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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).

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

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.

Introduction

0.1 Common introduction

The ISO 20579 series is intended to assist analysts and those seeking surface chemical analysis in the handling, storage, mounting and treatment of specimens. This is a multipart series, with the first two parts specifying general requirements for reporting of sample handling and storage (ISO 20579-1[1)]), and reporting of mounting and treatment of samples (ISO 20579-2[1)]). The ensuing parts combine any new requirements of sample handling/storage and/or sample mounting/preparation for classes of new materials. This document focuses on biomaterials analysis and handling, and ISO 20579-4 focuses on reporting and handling needs for nano-objects. Each part of this series can be used independently of the other parts, although the general procedures described in ISO 20579-1 and ISO 20579-2 are applicable to a wide range of materials and are not reproduced in detail in material-specific sections.

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 series will also be applicable to many other surface-sensitive analytical techniques such as ion-scattering spectrometry, 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 in thickness. Such thin layers may be subject to severe perturbations caused by specimen handling or surface treatments that may 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.

0.2 ISO 20579-3 introduction

This document is specifically intended to assist analysts in the handling, preparation and mounting of specimens submitted for surface chemical analysis of biomaterials. Applications of synthetic materials in a body includes metals, ceramics, polymers, glasses, carbons and composite materials. Surface-analysis techniques such as AES, XPS and SIMS were originally developed for the analysis of inorganic materials, but the methods described in this document may also be applicable to biomaterials. Many other surface-sensitive analytical techniques such as ion-scattering spectrometry, low-energy electron diffraction and electron energy-loss spectroscopy can be applied for specimen analysis. A few examples of biomaterial applications are artificial hip and knee joints, bone plates for fracture fixation, dental implants, optical devices (intraocular lenses), heart valves and stents for cardiovascular systems, and membrane materials for guided tissue regeneration. More examples are discussed elsewhere[1],[2].

Specimen handling can influence surface-sensitive measurements. Surface methods for chemical analysis are sensitive to surface layers that are typically only a few nanometers in thickness. Such thin layers may be subject to severe perturbations caused by improper specimen handling[4],[7] or surface treatments that may be necessary prior to introduction into the analytical chamber. Proper handling and preparation of specimens is particularly critical for biomaterial analysis. Improper handling of specimens can result in alteration of the surface composition and unreliable data.

Proper preparation and mounting of specimens are particularly critical for surface chemical analysis of biomaterials. Improper preparation may result in the alteration of the surface composition and in unreliable analyses. Specimens are handled carefully so that the introduction of spurious contaminants is avoided or minimized. The goal prior to analysis is to preserve the state of the surface during preparation and mounting so that the analysis remains representative of the original specimen. This document describes methods that the surface analyst may need to use in order to minimize the effects of specimen preparation when using any analytical method.

In addition, the change of composition of the surface of a biomaterial before and after implantation may be an issue related to contamination. It is intended to highlight general ideas about surface chemical analysis, in particular solid surfaces but also soft surfaces, such as self-assembled monolayers (SAMs), hydrogels, scaffolds and some polymers.

1) To be developed.