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Surface chemical analysis — Auger electron spectroscopy — Derivation of chemical information

Analyse chimique des surfaces — Spectroscopie des électrons Auger — Déduction de l'information chimique

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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).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword — Supplementary information.

The committee responsible for this document is ISO/TC 201, *Surface chemical analysis*, Subcommittee SC 7, *Electron spectroscopies*.

This second edition cancels and replaces the first edition (ISO/TR 18394:2006), which has been technically revised.

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Introduction

This Technical Report provides guidelines for the identification of chemical effects on X-ray or electron-excited Auger-electron spectra and for using these effects in chemical characterization.

Auger-electron spectra contain information on surface/interface elemental composition as well as on the environment local to the atom with the initial core hole[1][2][3][4][5]. Changes in Auger-electron spectra due to alterations of the atomic environment are called chemical (or solid-state) effects. Recognition of chemical effects is very important in proper quantitative applications of Auger-electron spectroscopy and can be very helpful in identification of surface chemical species and of the chemical state of constituent atoms in surface or interface layers.

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Surface chemical analysis — Auger electron spectroscopy — Derivation of chemical information

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1 Scope

This Technical Report provides guidelines for identifying chemical effects in X-ray or electron-excited Auger-electron spectra and for using these effects in chemical characterization.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 18115 (all parts), *Surface chemical analysis — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 18115 (all parts) apply.

4 Abbreviated terms

CCC	core-core-core (Auger-electron transition)
CCV	core-core-valence (Auger-electron transition)
CK	Coster-Kronig
c-BN	cubic boron nitride
CVV	core-valence-valence (Auger-electron transition)
DEAR-APECS	Dichroic Effect in Angle Resolved Auger-Photoelectron Coincidence Spectroscopy
h-BN	hexagonal boron nitride
IAE	Interatomic Auger Emission
ICD	Interatomic Coulomb Decay
PAES	Positron-Annihilation-induced Auger Electron Spectroscopy
REELS	Reflection Electron Energy-Loss Spectroscopy

5 Types of chemical and solid-state effects in Auger-electron spectra

Many types of chemical or solid-state effects can be observed in Auger-electron spectra[1][2][3][4][5]. Changes in the atomic environment of an atom ionized in its inner shell can result in a shift of the kinetic energy of the emitted Auger electron. In the case of X-ray-excited Auger-electron spectra, energy shifts of Auger parameters (i.e. kinetic-energy differences between Auger-electron peaks and the photoelectron peaks corresponding to the core levels involved in the Auger-electron process) can be detected as well. Furthermore, the line shape, the relative intensity and the satellite structure (induced by the intrinsic

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