TECHNICAL REPORT

ISO/TR 18394

First edition
2006-08-15

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

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

Reference number
ISO/TR 18394:2006(E)

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Published in Switzerland

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Foreword

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

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.

ISO/TR 18394 was prepared by Technical Committee ISO/TC 201, *Surface chemical analysis*, Subcommittee SC 5, *Auger electron spectroscopy*.

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]-[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.

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

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 referenced documents are indispensable for the application 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 18115:2001, *Surface chemical analysis — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 18115 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)
h-BN	hexagonal boron nitride
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]-[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 lineshape, the relative intensity and the satellite structure (induced by the intrinsic excitation processes) of the Auger-electron lines can be considerably influenced by chemical effects, as can the structure of the energy-loss region (induced by extrinsic, electron-scattering processes) accompanying the intrinsic peaks. Strong chemical effects on the Auger-electron spectral shapes offer ways of identification of chemical species using the “fingerprint” approach.