

JIS

JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS K 0147 : 2004

(ISO 18115 : 2001)

(OSTEC/JSA)

**Surface chemical analysis —
Vocabulary**

ICS 01.040.71;71.040.40

Reference number : JIS K 0147 : 2004 (E)

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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee according to the proposal of establishing a Japanese Industrial Standard from The Foundation of Osaka Science & Technology Center (OSTEC) / Japanese Standards Association (JSA), with a draft of Industrial Standard based on the provision of Article 12 Clause 1 of the Industrial Standardization Law:

This Standard has been made based on ISO 18115:2001 *Surface chemical analysis—Vocabulary* for the purposes of making it easier to compare this Standard with International Standard; to prepare Japanese Industrial Standard conforming with International Standard; and to propose a draft of an International Standard which is based on Japanese Industrial Standard.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

Date of Establishment: 2004-03-20

Date of Public Notice in Official Gazette: 2004-03-22

Investigated by: Japanese Industrial Standards Committee
Standards Board

Technical Committee on Basic Engineering

JIS K 0147 : 2005, First English edition published in 2005-04

Translated and published by: Japanese Standards Association
4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN

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the original JIS is to be the final authority.

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Printed in Japan

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Surface chemical analysis—Vocabulary

Introduction This Japanese Industrial Standard has been prepared based on the first edition of ISO 18115 *Surface chemical analysis—Vocabulary* published in 2001 without modifying the technical contents.

Portions underlined with dots are the matters not stated in the original International Standard.

1 Scope This Standard defines terms for surface chemical analysis.

In addition, the order of some terms is altered from ISO 18115.

Note : The International Standard corresponding to this Standard is as follows.

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and JIS are IDT (identical), MOD (modified), and NEQ (not equivalent) according to ISO/IEC Guide 21.

ISO 18115:2001 *Surface chemical analysis—Vocabulary* (IDT)

2 Abbreviations

AES	Auger electron spectroscopy
CDP	compositional depth profile
CMA	cylindrical mirror analyser
eV	electron volt
EELS	electron energy loss spectroscopy
EIA	energetic-ion analysis
EPMA	electron probe microanalysis
ESCA	electron spectroscopy for chemical analysis
FABMS	fast atom bombardment mass spectrometry
FWHM	full width at half maximum
GDS	glow discharge spectrometry
GDOES	glow discharge optical emission spectrometry
GDMS	glow discharge mass spectrometry
HEISS	high-energy ion-scattering spectrometry
HSA	hemispherical sector analyser

IBA	ion beam analysis
LEISS	low-energy ion-scattering spectrometry
MEISS	medium-energy ion-scattering spectrometry
ptp	peak-to-peak
RBS	Rutherford backscattering spectrometry
RFA	retarding field analyser
SAM	scanning Auger microscope
SDP	sputter depth profile
SEM	scanning electron microscope
SIMS	secondary-ion mass spectrometry
SNMS	sputtered neutral mass spectrometry
SSA	spherical sector analyser
TOF or ToF	time of flight
TXRF	total-reflection X-ray fluorescence spectroscopy
UPS	ultra-violet photoelectron spectroscopy
XPS	X-ray photoelectron spectroscopy

3 Format

3.1 Use of terms printed boldface in definitions A term printed boldface in a definition or a note is defined in another entry in this Standard. However, the term is printed boldface only the first time it occurs in each entry.

3.2 Non-preferred and deprecated terms A term listed lightface is non-preferred or deprecated. The preferred term is listed boldface.

3.3 Subject fields Where a term designates several concepts, it is necessary to indicate the subject field to which each concept belongs. The field is shown lightface, between angle brackets, preceding the definition, on the same line.

4 Definitions of the surface analysis methods

	Term (Japanese Character)	Reading	Definition	English equivalent
4.001	オージェ電子光法, AES	Ōzêdensikôhō AES	a method in which an electron spectrometer is used to measure the energy distribution of Auger electrons emitted from a surface NOTE: An electron beam in the energy range 2 keV to 30 keV is often used for excitation of the Auger electrons. Auger electrons can also be excited with X-rays, ions and other sources but the term Auger electron spectroscopy, without additional qualifiers, is usually reserved for electron-beam-induced excitations. Where an X-ray source is used, the Auger electron energies are referenced to the Fermi level but, where an electron beam is used, the reference may either be the Fermi level or the vacuum level . Spectra conventionally may be presented in the direct or differential forms.	Auger electron spectroscopy, AES
4.002	ダイナミック SIMS	Dainamikku SIMS	SIMS in which the material surface is sputtered at a sufficiently rapid rate that the original surface cannot be regarded as undamaged during the analysis NOTES 1 Dynamic SIMS is often simply termed SIMS. 2 The ion areic dose during measurement is usually more than 10^{16} ions/m ² .	dynamic SIMS
4.003	化学分析のための 電子分光法, ESCA	Kagakubunseki no-tameno- densibunkôhō, ESCA	a method encompassing both AES and XPS NOTE: The term ESCA has fallen out of use as, in practice, it was only used to describe situations more clearly defined by the term X-ray photoelectron spectroscopy (XPS). Since 1980, the latter term has been preferred.	electron spectroscopy for chemical analysis (deprecated), ESCA (deprecated)
4.004	高速原子衝撃質量 分析法, FABMS FAB	Kôsokugensi shôgekisituryô bunsekihô, FABMS FAB	a method in which a mass spectrometer is used to measure the mass-to-charge quotient and abundance of secondary ions emitted from a sample as a result of the bombardment by fast neutral atoms	fast atom bombardment mass spectrometry, FABMS, FAB (deprecated)
4.005	グロー放電質量分 析法, GDMS	Gurôhôdensituryô bunsekihô, GDMS	a method in which a mass spectrometer is used to measure the mass-to-charge quotient and abundance of ions from a glow discharge generated at a surface	glow discharge mass spectrometry, GDMS
4.006	グロー放電発光分 光法, GDOES	Gurôhôden hakkôbunkôhō GDOES	a method in which an optical emission spectrometer is used to measure the wavelength and intensity of light emitted from a glow discharge generated at a surface	glow discharge optical emission spectrometry, GDOES

	Term (Japanese Character)	Reading	Definition	English equivalent
4.007	グロー放電分析法, GDS	Gurôhôden bunsekihô, GDS	a method in which a spectrometer is used to measure relevant intensities emitted from a glow discharge generated at a surface NOTE: This is a general term which encompasses GDOES and GDMS .	glow discharge spectrometry, GDS
4.008	イオンビーム分析, IBA	Ionbîmubunseki, IBA	a method to elucidate composition and structure of the outermost atomic layers of a solid material, in which principally monoenergetic, singly charged probe ions , scattered from the surface are detected and recorded as a function of their energy or angle of scattering , or both NOTE: LEISS, MEISS and RBS are all forms of IBA in which the probe ion energies are typically in the ranges 0.1 keV to 10 keV, 50 keV to 200 keV and 1 MeV to 2 MeV, respectively. These classifications represent three ranges in which fundamentally different physics is involved.	ion beam analysis, IBA
4.009	二次イオン質量分析法, SIMS	Niziionsituryô bunsekihô, SIMS	a method in which a mass spectrometer is used to measure the mass-to-charge quotient and abundance of secondary ions emitted from a sample as a result of bombardment by energetic ions cf. dynamic SIMS , static SIMS NOTE: SIMS is, by convention, generally classified as dynamic, in which the material surface layers are continually removed as they are being measured, and static, in which the ion areic dose during measurement is restricted to less than 10^{16} ions/m ² in order to retain the surface in an essentially undamaged state.	secondary-ion mass spectrometry, SIMS
4.010	スパッタ中性粒子質量分析, SNMS	Supattatyûseiryûsi situryô bunseki, SNMS	a method in which a mass spectrometer is used to measure the mass-to-charge quotient and abundance of secondary ionized neutral species emitted from a sample as a result of particle bombardment NOTE: The neutral species may be detected by using plasma, electron, or photon ionization methods.	sputtered neutral mass spectrometry, SNMS

	Term (Japanese Character)	Reading	Definition	English equivalent
4.011	スタティック SIMS	Sutatikku SIMS	SIMS in which the material surface is sputtered at a sufficiently low rate that the original surface is insignificantly damaged during the analysis cf. dynamic SIMS NOTE: The ion areic dose during measurement is restricted to less than 10^{16} ions/m ² to an extent that depends on both the material of the sample and the size of the molecular fragments being analysed.	static SIMS
4.012	全反射蛍光 X 線分 光法, TXRF	Zenhansyakeikô ekkususen bunkôhō, TXRF	a method in which an X-ray spectrometer is used to measure the energy distribution of fluorescence X-rays emitted from a surface irradiated by primary X-rays under the condition of total reflection	total reflection X-ray fluorescence spectroscopy, TXRF
4.013	紫外光電子分光 法, UPS	Sigaikôdensi bunkôhō, UPS	a method in which an electron spectrometer is used to measure the energy distribution of photoelectrons emitted from a surface irradiated by ultra-violet photons NOTE: Ultra-violet sources in common use include various types of discharges that can generate the resonance lines of various gases (e.g. the He I and He II emission lines at energies of 21.2 eV and 40.8 eV, respectively). For variable energies, synchrotron radiation is used.	ultra-violet photoelectron spectroscopy, UPS
4.014	X 線光電子分光 法, XPS	Ekkususenkôdensi bunkôhō, XPS	a method in which an electron spectrometer is used to measure the energy distribution of photoelectrons and Auger electrons emitted from a surface irradiated by X-ray photons NOTE: X-ray sources in common use are Al and Mg unmonochromated <i>Kα</i> X-rays at 1 486.6 and 1 253.6 eV, respectively. Modern instruments also use monochromated Al <i>Kα</i> X-rays. Some instruments make use of various X-ray sources with other anodes or of synchrotron radiation .	X-ray photo- electron spectroscopy, XPS

5 Definitions of terms for surface analysis

	Term (Japanese Character)	Reading	Definition	English equivalent
5.001	線形吸収係数	Senkeikyûshû keisû	linear attenuation coefficient	linear absorption coefficient
5.002	質量吸収係数 質量減衰係数	Situyuryôkyûshû keisû Situyuryôgensui keisû	(TXRF, XPS) quantity μ/ρ in the expression $(\mu/\rho) \Delta(\rho_x)$ for the fraction of a parallel beam of specified particles or radiation removed in passing through a thin layer of mass thickness $\Delta(\rho_x)$ of a substance in the limit as $\Delta(\rho_x)$ approaches zero, where $\Delta(\rho_x)$ is measured in the direction of the beam cf. attenuation length NOTES 1 The mass density of the substance is ρ and χ is the distance in the direction of the beam. 2 The intensity or number of particles in the beam decays as $\exp(-\mu_x \chi)$ with the distance χ . 3 The mass attenuation (absorption) coefficient is the quotient of the linear attenuation (absorption) coefficient and the mass density of the substance.	mass absorption coefficient, mass attenuation coefficient
5.003	自然付着炭素エネルギー基準	Sizenhuchaku tansoenerugi kizyun	(XPS) determining the charging potential of a particular sample from a comparison of the experimentally determined C 1s binding energy, arising from adsorbed hydrocarbons on the sample, with a standard binding energy value cf. internal carbon referencing NOTE: A nominal value of 285.0 eV is often used for the binding energy of the relevant C 1s peak, although some analysts prefer specific values in the range 284.6 eV to 285.2 eV depending on the nature of the substrate.	adventitious carbon referencing
5.004	変質層	Hensitusô	(particle bombardment) surface region of a material under particle bombardment where the chemical state or physical structure is modified by the effects of the bombardment Example: For silicon bombarded by 4 keV O_2^+ at near normal incidence, after sputtering for a sufficient time to reach a steady state, the surface is converted to stoichiometric SiO_2 to a depth of around 15 nm with lower oxygen concentrations at greater depths.	altered layer
5.005	分析領域	Bunsekiryôiki	(sample) two-dimensional region of a sample surface measured in the plane of that surface from which the entire analytical signal or a specified percentage of that signal is detected	analysis area

	Term (Japanese Character)	Reading	Definition	English equivalent
5.006	分析領域	Bunsekiryôiki	(spectrometer) two-dimensional region of a sample surface at the analytical point but set in the plane at right angles to the spectrometer axis from which the entire analytical signal or a specified percentage of that signal is detected	analysis area
5.007	分析体積	Bunsekitaiseiki	(sample) three-dimensional region of a sample from which the entire analysis signal or a specified percentage of that signal is detected	analysis volume
5.008	分析体積	Bunsekitaiseiki	(spectrometer) three-dimensional region within the spectrometer from which the entire analytical signal or a specified percentage of that signal may be detected	analysis volume
5.009	臨界角	Rinkaikaku	(TXRF) glancing angle at which the sample matrix X-ray fluorescence, when plotted against the glancing angle, is at the first point of inflection	critical angle
5.010	視射角	Sisyakaku	(TXRF) angle between the incident beam and the average surface plane NOTE: Angle of incidence and glancing angle are complementary.	glancing angle
5.011	斜め研磨	Nanamekenma	sample preparation in which a sample is mechanically polished at an angle to the original surface cf. ball cratering, radial sectioning NOTE: This angle may often be less than 1° so that depth information with respect to the original surface is transformed to lateral information.	angle lapping
5.012	マジックアングル	Mazikkuanguru	(XPS) angle at which the spectrometer entrance axis is aligned at 54.7° to the direction of the X-rays at the sample surface NOTE: At the magic angle, using the simple dipole theory for the angular distribution of the photoelectrons emitted from an isolated atom irradiated by unpolarized X-rays, it is predicted that the intensity per unit solid angle is the same as the intensity that would be obtained if the scattering were isotropic.	magic angle
5.013	放出角度	Hôshutukakudo	angle between the trajectory of a particle or photon as it leaves a surface and the local or average surface normal NOTE: The particular surface normal needs to be specified.	angle of emission
5.014	入射角	Nyûshakaku	angle between the incident beam and the local or average surface normal NOTE: The particular surface normal, such as the surface normal to an elementary portion of a rough surface or the normal to the average surface plane, needs to be specified.	angle of incidence

	Term (Japanese Character)	Reading	Definition	English equivalent
5.015	散乱角	Sanrankaku	angle between the direction of the incident particle or photon and the direction that the particle or photon is travelling after scattering	angle of scattering
5.016	角度分解 AES, ARAES, 角度依存 AES	Kakudobunkai AES, ARAES, Kakudoizon AES	a procedure in which Auger electron intensities are measured as a function of the angle of emission	angle-resolved AES, ARAES, angle-dependent AES
5.017	角度分解 XPS, ARAES, 角度依存 AES	Kakudobunkai XPS, ARXPS, Kakudoizon XPS	a procedure in which X-ray photoelectron intensities are measured as a function of the angle of emission NOTE: This procedure is often used to obtain information on the distribution with depth of different elements or compounds in a layer approximately 5 nm thick at the surface.	angle-resolved XPS, ARXPS, angle-dependent XPS
5.018	分光器立体角	Bunkôki rittaikaku	solid angle of analyser that will transmit particles or photons from a point on the sample to the detector cf. analyser transmission function	solid angle of analyser
5.019	検出器立体角	Kenshutuki rittaikaku	(EIA, RBS) solid angle intercepted by the detector from an origin at the centre of the beam spot	solid angle of detector
5.020	脱出角	Dasshutukaku	angle between the trajectory of a particle as it leaves a surface and the local or average surface plane NOTES 1 The particular surface plane needs to be specified. 2 Take-off angle is the complement of angle of emission . 3 In the past, take-off angle has sometimes been used erroneously to mean angle of emission.	take-off angle
5.021	非対称性パラメータ, β	Hitaishôsei paramêta, β	(XPS) factor which characterizes the intensity distribution, $L(\gamma)$, of photoelectrons ejected by unpolarized X-rays from isolated atoms in a direction γ from the incident X-ray direction according to $L(\gamma) = 1 + 1/2\beta [(3/2)(\sin^2\gamma) - 1]$ NOTE: This formula relates to gases and is modified by the effects of elastic scattering when applied to solids.	asymmetry parameter, β
5.022	アトムミキシング	Atomikku mikisingu	migration of sample atoms due to energy transfer with incident particles in the surface region cf. cascade mixing, collision cascade, ion-beam-induced mass transport, knock-on, recoil implantation	atomic mixing

	Term (Japanese Character)	Reading	Definition	English equivalent
5.023	減衰係数	Gensuikaisū	quantity μ in the expression $\mu\Delta x$ for the fraction of a parallel beam of specified particles or radiation removed in passing through a thin layer Δx of a substance in the limit as Δx approaches zero, where Δx is measured in the direction of the beam cf. attenuation length, mass absorption coefficient NOTES 1 The intensity or number of particles in the beam decays as $\exp(-\mu x)$ with the distance x. 2 Attenuation coefficient is often used in place of linear attenuation coefficient and is used in EPMA. Both are the reciprocal of attenuation length which is used in AES and XPS.	attenuation coefficient
5.024	減衰長さ	Gensui nagasa	quantity l in the expression $\Delta x/l$ for the fraction of a parallel beam of specified particles or radiation removed in passing through a thin layer Δx of a substance in the limit as Δx approaches zero, where Δx is measured in the direction of the beam cf. attenuation coefficient, decay length, effective attenuation length, electron inelastic mean free path, linear absorption coefficient, mass absorption coefficient NOTES 1 The intensity or number of particles in the beam decays as $\exp(-x/l)$ with the distance x. 2 For electrons in solids, the behaviour only approximates an exponential decay due to the effects of elastic scattering. Where this approximation is valid, the term effective attenuation length is used. <u>Informative:</u> For quantity l in the expression $\Delta x/l$ for the fraction of a parallel beam of specified particles or radiation removed or quantity in the expression for a function for x in passing through a thin layer x of a substance, as Δx approaches zero, quantity l given by the inverse of quantity in the limit while particles or light are passing through, where x is measured in the direction of the beam.	attenuation length

	Term (Japanese Character)	Reading	Definition	English equivalent
5.025	有効減衰長さ	Yūkôgensui nagasa	average emission function decay length when the emission depth distribution function is sufficiently close to exponential for a given application cf. attenuation length NOTE: Effective attenuation length is often used in AES and XPS to describe the transport of electrons that have not lost more than 1 eV as a result of inelastic scattering.	effective attenuation length
5.026	オージェ脱励起	Ôzêdatureiki	(surface) a) process in which the energy of an excited atom or ion is given up by a non-radiative re-arrangement of electrons in that atom or ion b) process in which the energy in a metastable species near a solid surface is lost by interaction with the surface, and in the process enough energy is released to eject an electron from a surface atom cf. Auger neutralization NOTE: For both processes, the electron may be ejected into the vacuum.	Auger de-excitation
5.027	オージェ電子	Ôzêdensi	electron emitted from atoms in the Auger process cf. Auger transition NOTES 1 Auger electrons can lose energy by inelastic scattering as they pass through matter. Measured Auger electron spectra are therefore generally composed of a peak structure of unscattered Auger electrons superimposed on a background of inelastically scattered Auger electrons with intensities extending to lower kinetic energies, and on backgrounds arising from other processes. 2 Auger electrons may change their direction of propagation by elastic scattering as they pass through matter.	Auger electron

	Term (Japanese Character)	Reading	Definition	English equivalent
5.028	オージェ電子スペクトル	Ôzêdensi supekutoru	plot of the Auger electron intensity as a function of the electron kinetic energy , usually as part of the energy distribution of detected electrons NOTES 1 When excited by incident electrons, the energy distribution of detected electrons, often measured between 0 eV and 2 500 eV, contains Auger electrons, backscattered (primary) electrons and secondary electrons . The entire distribution is sometimes referred to as an Auger electron spectrum. 2 The Auger electron spectrum may be presented in either the direct spectrum or differential spectrum formats.	Auger electron spectrum
5.029	オージェ電子収率	Ôzêdensishûritu	probability that an atom with a vacancy in a particular inner shell will relax by an Auger process [1]	Auger electron yield
5.030	オージェ中和	Ôzêchûwa	(ion at a surface) a process in which an electron, tunnelling from the conduction band of a solid, neutralizes an incoming ion and an electron is ejected from a surface atom NOTE: The ejected electron may be emitted into the vacuum.	Auger neutralization
5.031	オージェパラメータ	Ôzêparamêta	(XPS) kinetic energy of a narrow Auger electron peak in a spectrum minus the kinetic energy of the most intense photoelectron peak from the same element cf. initial state Auger parameter, modified Auger parameter NOTES 1 The value of the Auger parameter depends on the energy of the X-rays which therefore needs to be specified. 2 The Auger parameter is sometimes called the final state Auger parameter. 3 The Auger parameter is useful for separating chemical states for samples in which charging causes uncertainty in the binding energy measurement or in which the binding energy shift is inadequate to identify the chemical state. 4 The Auger parameter is useful for evaluating the relaxation energy of the ionized matrix atom associated with the generation of a core hole for those Auger transitions between core levels which have similar chemical shifts.	Auger parameter

	Term (Japanese Character)	Reading	Definition	English equivalent
5.032	始状態オージェパラメータ	Sizyôtaiôzê paramêta	(XPS) β , where $\beta = 3E_B + E_K$ and where E_B and E_K are, respectively, the binding energy of a photoelectron peak and the Fermi level referenced kinetic energy of an Auger electron peak, each involving the same initial core level of the same element cf. Auger parameter, modified Auger parameter NOTE: The initial state Auger parameter is useful for evaluating the change in the atomic core potential contribution to changes in binding energy between two environments, providing the Auger transition is between core levels which have similar binding energy shifts.	initial state Auger parameter
5.033	修正オージェパラメータ	Syûseiôzê paramêta	(XPS) sum of the Fermi level referenced kinetic energy of a narrow Auger electron peak in the spectrum and the binding energy of the most intense photoelectron peak from the same element cf. Auger parameter, initial state Auger parameter NOTE: The modified Auger parameter is the sum of the Auger parameter and the energy of the X-rays responsible for the measured photoelectron peak. Unlike the Auger parameter, it does not depend on the energy of the X-rays.	modified Auger parameter
5.034	オージェ過程	Ôzêkatei	relaxation, by electron emission, of an atom with a vacancy in an inner electron shell [1] cf. Auger de-excitation, Auger electron, Auger transition NOTE: The emitted electrons have characteristic energies, defined by the Auger transition.	Auger process
5.035	原子間オージェ過程	Gensikanôzê katei	(AES) Auger transition in which at least one of the final electron vacancies is localized in valence levels or molecular orbitals of atoms adjacent to the atom in which the initial vacancy occurred	interatomic Auger process

	Term (Japanese Character)	Reading	Definition	English equivalent
5.036	オージェ遷移	Ôzêseni	Auger process involving designated electron shells or sub-shells NOTES 1 The three shells involved in the Auger process are designated by three letters. The first letter designates the shell containing the initial vacancy and the last two letters designate the shells containing electron vacancies left by the Auger process (for example, KLL, and LMM). When a valence electron is involved, the letter V is used (for example, LMV and KVV). When a particular sub-shell involved is known, this can also be indicated (for example, KL₁L₂). Coupling terms may also be added, where known, to indicate the final atomic state (for example, L₃M_{4,5}M_{4,5}¹D). 2 More complicated Auger processes (such as multiple initial ionizations and additional electronic excitations) can be designated by separating the initial and final states by a dash (for example, LL-VV and K-VVV). 3 When an Auger process involves an electron from the same principal shell as the initial vacancy (for example, L₁L₂M), it is referred to as a Coster-Kronig transition. If all electrons are from the same principal shell (for example, M₁M₂M₃), the process is called a super Coster-Kronig transition.	Auger transition
5.037	オージェ遷移速度	Ôzê senisokudo	quotient of the probability for an Auger process by time	Auger transition rate
5.038	非弾性散乱バックグラウンド	Hidanseisanran bakkuguraundo	intensity distribution in the spectrum for particles originally at one energy but which are emitted at lower energies due to one or more inelastic scattering processes cf. inelastic scattering background subtraction, Shirley background, Sickafus background, Tougaard background NOTE: For AES and XPS, the inelastic background associated with a particular Auger electron or photoelectron peak has been approximated by a measured electron energy loss spectrum for which the incident electron energy is close to the energy of the peak. The Tougaard background is also used. A simpler, but less accurate, inelastic background function is the Shirley background. Simple linear backgrounds have also been used but these are much less accurate, except for the XPS analysis of insulators.	inelastic background

	Term (Japanese Character)	Reading	Definition	English equivalent
5.039	装置起源バック グラウンド	Sôtikigen bakkuguraundo	intensity contribution, generally un- wanted, arising from non-ideal behaviour of one or more parts of the instrument	instrumental background
5.040	シャーリーバック グラウンド	Syârîbakku guraundo	(AES, XPS) background calculated to fit the measured spectrum at points at higher and lower kinetic energy than the peak or peaks of interest such that the background contribution at a given kinetic energy is in a fixed proportion to the total peak area above that back- ground for higher kinetic energies cf. Tougaard background	Shirley background
5.041	シッカフスバック グラウンド	Sikkahusu bakkuguraundo	(AES, XPS) single-term power law back- ground designed to describe the inten- sity of the secondary electron cascade as a function of electron emission kinetic energy NOTES 1 The measured secon- dary-electron cascade, for correct application of the Sickafus background, should be the experimentally ob- served spectrum corrected for the spectrometer response function of the measuring in- strument. 2 The spectrum shape, for a Sickafus background $B_s(E)$ is given by $B_s(E) \propto E^{-m}$ where, E is the electron emission ki- netic energy and m is a number in the range 1 to 2.	Sickafus background
5.042	バックグラウン ド信号	Bakkuguraundo singô	signal present at a particular position, energy, mass or wavelength due to proc- esses or sources other than those of pri- mary interest cf. Shirley background, Sickafus back- ground, Tougaard background	background signal
5.043	ツガードバック グラウンド	Tugâdo bakkuguraundo	(AES, XPS) intensity distribution ob- tained from a model for the differential inelastic scattering cross-section with respect to energy loss and the three-dimensional distribution of the emitting atoms in the surface region cf. Shirley background NOTES 1 A number of classes of atomic distributions may be used together with different dif- ferential inelastic scattering cross-sections. The atomic distribution and the inelastic scattering cross-section should be specified. 2 The Tougaard background is usually calculated to match the measured spectrum over a wide energy range that ex- cludes the peak region and the spectral region extending to approximately 50 eV less kinetic energy than the peaks of interest. The measured spectrum should be corrected for the spectrometer response function of the measuring in- strument before calculation of the Tougaard background.	Tougaard background

	Term (Japanese Character)	Reading	Definition	English equivalent
5.044	背面散乱電子	Haimensanran densi	(AES, EELS) electron originating in the incident beam which is emitted after interaction with the sample NOTES 1 By convention, an electron with energy greater than 50 eV may be considered as a backscattered electron. 2 By convention, the incident beam is often called the primary beam and the back-scattered electrons are often referred to as the backscattered primary electrons .	backscattered electron
5.045	後方散乱係数, 後方散乱収率	Kôhōsanran keisû, Kôhōsanran syûritu	(EIA, RBS) quotient of the number of detected particles in an interval of backscattering energy by that interval and by the number of incident ions	backscattering coefficient, backscattering yield
5.046	後方散乱エネルギー	Kôhōsanran enerugî	energy of a particle from the primary beam after it has undergone a back-scattering collision and escaped from the sample Informative: It is mainly used for EIA and RBS.	backscattering energy
5.047	背面散乱因子	Haimensanran insi	(AES) factor defining the increase in the Auger electron current due to additional ionizations in the sample caused by backscattered electrons above that arising directly from the primary electrons NOTE: Different usages exist; the factor is commonly the fractional increase, as defined above, and sometimes unity plus that fractional increase. The latter usage is deprecated. For clarity, the particular usage needs to be defined.	backscattering factor
5.048	後方散乱スペクトル	Kôhōsanran supekutoru	(EIA, RBS) plot of backscattering yield versus backscattering energy [1]	backscattering spectrum
5.049	背面散乱収率, 背面散乱係数 η	Haimensanran syûritu, Haimensanran keisû η	(AES, EPMA) ratio of the total number of electrons emitted from the sample with energies greater than 50 eV to the total number of electrons incident at a given energy and angle of incidence cf. secondary-electron yield, total secondary-electron yield, backscattering factor	backscattering yield, backscattering coefficient, η
5.050	ボールクレータ法	Bôrukurêtahô	a procedure in which the sample is abraded by a sphere in order to expose compositional changes in layers below the original surface with the intent that the depth of those layers can be related to the lateral position in the crater created by the abrasion cf. angle lapping, radial sectioning	ball cratering

	Term (Japanese Character)	Reading	Definition	English equivalent
5.051	ビーム収束角	Bimusyûsoku- kaku	angular interval containing all or a specified fraction of the beam in the space prior to or at the focal plane cf. beam divergence angle NOTE: Where the beam is symmetrical, the full or semi-angle may be used. The particular measure of angle needs to be stated.	beam convergence angle
5.052	ビーム電流 I	Bimudenryû I	quotient of dQ by dt , where dQ is the quantity of electric charge of a specified polarity in the beam passing in the time interval dt $I = dQ/dt$ cf. pulse beam current, average beam current NOTE: For beams in which the current varies with time, the instantaneous and time-averaged beam currents will generally differ. For a pulsed beam, the current when the beam is on may or may not be equal to the d.c. or unpulsed beam current.	beam current, I
5.053	平均ビーム電流	Heikinbîmu denryû	quotient of Q by t , where Q is the quantity of electric charge of a specified polarity in the beam passing in the time interval t NOTE: For beams in which the instantaneous current varies periodically with time, the time interval t is an integral number of periods.	average beam current
5.054	ビーム電流密度, J	Bimudenryû mitudo J	(for a parallel beam of charged particles) quotient of dI by dA where dI is the element of beam current incident on an area dA at right angles to the direction of the beam $J = dI/dA$ cf. fluence, flux, dose NOTE: For a convergent or divergent beam, the area dA is replaced by a small sphere of cross-sectional area dA .	beam current density, J
5.055	累積ビーム電流	Ruisekibîmu denryû	total electric charge transported in the beam over a specified time	integrated beam current
5.056	パルスビーム電流	Parusubîmu denryû	quotient of Q by t_p where Q is the quantity of electric charge of a specified polarity in the beam passing during the period t_p in which the pulse is on	pulse beam current
5.057	ビーム径	Bimukei	(for a particle beam of circular cross-section) full width of the beam at half maximum intensity measured in a plane normal to the beam direction [1] NOTE: The beam diameter is usually specified at a given point in space such as the position of the sample.	beam diameter

	Term (Japanese Character)	Reading	Definition	English equivalent
5.058	ビーム拡がり角	Bîmuhirogari kaku	angular interval containing all or a specified fraction of the beam in the space after the focal plane cf. beam convergence angle NOTE: Where the beam is symmetrical, the full or semi-angle may be used. The particular measure of angle needs to be stated.	beam divergence angle
5.059	ビームエネルギー	Bîmuenerugî	kinetic energy of the beam particles cf. beam impact energy, incident-particle energy NOTES 1 The energy is usually given in electron volts. 2 The beam energy is often taken to be the particle energy on impact at the sample surface. However, where a sample is at a potential other than ground, the impact energy of the particles may differ from the beam energy as delivered by an electron or ion gun to the sample environment. In this case, use of the term impact energy avoids confusion.	beam energy
5.060	ビーム衝撃エネルギー	Bîmusyôgeki enerugî	kinetic energy of the beam particles on impact with the sample surface cf. beam energy, incident-particle energy NOTES 1 For primary ion beams in SIMS, the beam impact energy is given by the difference in electric potential between the ion source, strictly the plasma meniscus, and the sample surface multiplied by the charge on the ion. In some SIMS systems, the beam energy is given for the source potential with respect to ground but the sample potential need not be at ground. The impact energy takes account of any sample potential. 2 Use of the qualifier "impact" indicates that this is the energy of the particles striking the surface.	beam impact energy
5.061	ビーム粒子	Bîmuryûsi	electron, positron, ion, atomic, molecular or cluster species contained in the incident beam	beam particle
5.062	一次ビーム	Itizibîmu	directed flux of particles or photons incident on a sample	primary beam
5.063	ビームプロファイル	Bîmupurohuairu	spatial distribution of the beam flux in a plane normal to the beam axis	beam profile

	Term (Japanese Character)	Reading	Definition	English equivalent
5.064	二体弾性散乱, 弾性散乱	Nitaidansei sanran, Dansei sanran	collision between a moving particle and a second particle in which the total kinetic energy and the total momentum are conserved cf. inelastic scattering NOTE: In elastic scattering interactions, the moving particle may be deflected through angles of up to 180°.	binary elastic scattering
5.065	二体弾性散乱ピーク	Nitaidansei sanranpiku	(ISS) increase in the spectrometer detection system response above the background level which can be attributed to binary elastic scattering of an incident ion by a surface atom of a particular mass [1]	binary elastic scattering peak
5.066	束縛エネルギー	Sokubaku enerugi	energy that must be expended in removing an electron from a given electronic level to the Fermi level of a solid or to the vacuum level of a free atom or molecule Informative: It is also called combining energy by convention.	binding energy
5.067	ブロッキング配置	Burokkingu haiti	(EIA, RBS) experimental arrangement wherein the atom rows or planes of a single crystal target are aligned parallel to a vector from the sample to the detector [1]	blocking geometry
5.068	ブラッグ則	Buraggusoku	empirical rule formulated by W.H. Bragg and R. Kleeman that states that the stopping cross-section of a compound sample is equal to the sum of the products of the elemental stopping cross-sections for each constituent and its atomic fraction, that is, $\varepsilon(A_x B_y) = x\varepsilon_A + y\varepsilon_B$ where, $\varepsilon(A_x B_y)$, is the stopping cross-section of the compound, $A_x B_y$, and ε_A and ε_B are the stopping cross-sections of elements A and B, respectively [1]	Bragg's rule

	Term (Japanese Character)	Reading	Definition	English equivalent
5.069	制動放射	Seidôhōsya	(EPMA, XPS) photon radiation emitted from a material due to the deceleration of incident electrons within that material NOTES 1 The bremsstrahlung radiation has a continuous spectral distribution up to the energy of the incident electrons. 2 In XPS, The bremsstrahlung from a conventional X-ray source with an Al or Mg anode leads to a continuous photoelectron background. This radiation may also photoionize inner shells that would be energetically impossible by characteristic Al or Mg Kα X-rays. As a result, Auger electron features may appear at negative binding energy values and, in addition, the intensities of other Auger electron features may be greater than if the inner shell vacancies had been created only by the characteristic X-rays. The bremsstrahlung-excited Auger electron features can be helpful in determining the various Auger parameters needed to identify chemical states.	bremsstrahlung

	Term (Japanese Character)	Reading	Definition	English equivalent
5.070	カスケードミキ シング	Kasukêdo mikisingu	a diffusion-like process in which atoms of material are moved randomly by energy deposited by incident particles slowing down in the sample surface region cf. atomic mixing, collision cascade, knock-on, recoil implantation NOTES 1 If atomic mixing and knock-on effects are not significant, the measured sputter depth profile of a delta layer will be asymmetric on account of cascade mixing since the surface moves through the sample as it is sputtered. The initial internal profile produced will be Gaussian, however until significant delta material has been lost through the sample surface. 2 If cascade mixing is the only significant mixing process, the centroid of the measured distribution will lie at the true delta position (after any shift in the depth scale arising from pre-equilibrium effects has been corrected). 3 In the dilute limit, the measured depth profile for the delta layer will have an exponential tail because any internal atom has an equal probability of being moved deeper or shallower and there is thus an indefinitely persistent but decaying concentration in the near-surface region. The presence of this tail often leads to the belief that there is a directional knock-on process at work. True knock-on effects have rarely if ever been observed, and are probably not significant as causes of sputter profile distortion.	cascade mixing
5.071	チャネリング	Tyaneringu	preferential motion of energetic particles along certain axial or planar directions of a crystalline solid as the particles move through the sample NOTE: The potentials of the individual atoms of the solid combine to reduce the scattering of the energetic particles from these directions.	channelling

	Term (Japanese Character)	Reading	Definition	English equivalent
5.072	特性電子エネルギー損失	Tokuseidensi enerugisonsitu	(AES, EELS, XPS) inelastic scattering of electrons in solids that produces a non-uniform energy loss spectrum determined by the characteristics of the material cf. plasmon NOTES 1 The most probable characteristic losses arise from excitation of valence electrons. For some solids (for example, non-transition metals), inelastic scattering is dominated by plasmon excitations. For other solids, the inelastic scattering may be due to a combination of plasmon excitation and single valence-electron excitations, and these excitations may not be distinguishable. Inelastic scattering can also occur through the excitation of core level electrons when this is energetically possible. 2 The characteristic energy losses are most prominent in the energy loss range 0 eV to 100 eV. 3 Characteristic electron energy loss peaks are often observed in association with other peaks in a spectrum (e.g. Auger electron peaks, photoelectron peaks, and the peak arising from elastic scattering of primary electrons).	characteristic electron energy losses
5.073	特性 X 線	Tokusei ekkususen	photons emitted by ionized atoms and having a particular distribution in energy and intensity characteristic of the atomic number and chemical environment of the atom [1] NOTES 1 In XPS, the term is applied to the X-ray source used to excite photoelectrons in the sample. 2 In EPMA, characteristic X-rays emitted from the sample are detected and analysed to give information on the composition of the sample.	characteristic X-rays
5.074	電荷操作	Denkasôsa	alteration of the amount or the distribution of charge at a sample surface	charge modification
5.075	帯電中和	Taidentyûwa	maintenance at a fixed potential, usually near neutrality, of the surface of a non-conducting or poorly conducting sample material under bombardment by primary particles or photons NOTE: Charge neutralization may be accomplished by bombarding the surface with electrons or, more rarely, ions or photons.	charge neutralization

	Term (Japanese Character)	Reading	Definition	English equivalent
5.076	帯電補正	Taidenhosei	(AES, XPS) method by which the charging potential of a sample is determined in order to correct the measured energies so that those energies correspond to a sample with no surface change cf. adventitious carbon referencing NOTE: Charge referencing is often conducted using adventitious carbon referencing or by gold decoration .	charge referencing
5.077	帯電電位	Taidendeni	electrical potential of the surface region of an insulating sample caused by irradiation NOTE: Different charging potentials may occur on different areas or at different depths in a sample arising from sample inhomogeneities or non-uniform intensity of the incident flux of radiation	charging potential
5.078	化学効果	Kagaku kôka	(AES, EELS, EPMA, XPS) change in the shape of a measured spectrum, or in the peak energy for an element, arising from chemical bonding	chemical effects
5.079	化学シフト	Kagakusihuto	(AES, EELS, EMPA, XPS) change in peak energy arising from a change in the chemical environment of the atom	chemical shift
5.080	衝突カスケード	Syôtotu kasukêdo	sequential energy transfer between atoms in a solid as a result of bombardment by an energetic species [1] cf. atomic mixing, cascade mixing, knock-on, recoil implantation	collision cascade
5.081	深さ方向組成分布, CDP	Hukasahôkô soseibunpu CDP	chemical or atomic composition measured as a function of distance normal to the surface	compositional depth profile, CDP
5.082	ΔE 一定モード, 分光器エネルギー一定モード, CAE モード, 分光器トランスミッション固定モード, FAT モード	ΔE itteimôdo, Bunkôkienerugi môdo, CAE môdo, Bunkôkitoran-sumissyonkotei môdo, FAT môdo	mode of electron energy analyser operation that varies the electron retardation but keeps the pass energy constant in the energy dispersive portion of the analyser NOTE: This mode is often used in XPS to maintain a high and constant energy resolution throughout the spectrum.	constant ΔE mode, constant analyser energy mode, CAE mode, fixed analyser transmission mode, FAT mode
5.083	$\Delta E/E$ 一定モード, 原則率一定モード, CRR モード, 減速率固定モード, FRR モード	$\Delta E/E$ ittei môdo, Gensokuritu ittei môdo, CRR môdo, Gensokuritu kotei, môdo, FRR môdo	mode of electron energy analyser operation that varies the retarding potential so that the pass energy in the energy dispersive portion of the analyser is a constant fraction of the original vacuum level referenced kinetic energy NOTE: This mode is often used in AES to improve the signal-to-noise ratio for high-energy emitted electrons at the expense of spectral resolution.	constant $\Delta E/E$ mode, constant retardation ratio mode, CRR mode, fixed retardation ratio mode, FRR mode
5.084	コスタークロニッヒ遷移	Kosutâ kuronihhiseni	(AES, EPMA, XPS) Auger process involving an electron from the same principal shell as the initial vacancy cf. Auger transition, super Coster-Kronig transition Examples: $L_1L_2M_5$; $M_1M_2N_5$	Coster-Kronig transition

	Term (Japanese Character)	Reading	Definition	English equivalent
5.085	カウント	Kaunto	total number of pulses recorded by a detector system in a defined time interval NOTE: The counts may be representative, one-for-one, with the particles being detected (in the absence of dead time losses in the counting measurement), in which case they follow Poissonian statistics (unless other noise sources are present) or they may simply be proportional to the number of particles being detected. The type of measure needs to be clearly stated.	counts
5.086	クレータ深さ	Kurêtahukasa	average depth of the region of a crater from which the measured signal is derived NOTES 1 The crater is generally formed by ion bombardment in sputter depth profiling and, in this case, may be different from the thickness of sample material removed by sputtering due to dilation of the altered layer . 2 The crater depth may be modified by the formation of a reacted layer (e.g. an oxide) following any exposure to the atmosphere or other environments.	crater depth
5.087	クレータエッジ効果	Kurêtaezzikôka	signals from the crater edge which often originate from depths shallower than the central region of the crater formed in depth profiling	crater edge effect
5.088	断面積	Danmenseki	(for a specified target entity and for a specified reaction or process produced by incident charged or uncharged particles of specified type and energy) quotient of probability of reaction or process for the target entity by the incident-particle fluence [2] NOTES 1 Cross-sections are often expressed as an area per target entity (atom, molecule etc.) for the relevant process. 2 A cross-section of σ per atom for the removal of particles from a given state in a beam will lead to a reduction dN in the number of N of particles in that state in a distance dx given by the relation: $dN = N\sigma ndx$ where n is the density of atoms traversed by the beam. Integration leads to the relation: $N = N_0 \exp(-n\sigma x)$ where N_0 is the value of N at the origin of x .	cross-section