

17.6.3 Recommendations for abbreviations in surface science and chemical spectroscopy

The overall list of selected techniques and their abbreviations have been subdivided under the following principal headings.

- (1) The electron, photoelectron and related spectroscopies
- (2) The proton spectroscopies resulting from the use of electromagnetic radiation
- (3) Neutron and ion scattering
- (4) Mass spectroscopy
- (5) Other spectroscopic techniques
- (6) Desorption and related techniques
- (7) Diffraction techniques
- (8) Spectroscopy/Diffraction hybrids
- (9) Microscopy techniques in Surface Science

A series of tables follows, in order of the above principal headings. Within a given table the various techniques are listed in the left-hand column, where necessary with alternative names. Three columns of abbreviations are given in the table with entries opposite each technique listed. The first one is the abbreviation that would relate to the name of the technique using the systematic procedures described above; the second lists abbreviations that have been widely used; the final entry gives the abbreviation recommended for future use from amongst those given in the previous two columns.

At this stage no attempt has been made to suggest abbreviations for other than fairly well-established techniques, but elaborations on those given can be generated by adding letters to the left of the basic abbreviation using the recommendation for descriptive adjectives or phrases given in (iii) of the section Alphabet of Symbols for Use in Spectroscopy and Surface Science, e.g. X-ray excited Auger electron spectroscopy (XAES) or angle-resolved Auger electron spectroscopy (ARAES). For this purpose it is even more important that the abbreviations for the basic techniques become well-established.

In the table those descriptions of the techniques which are in accord with the systematic principles outlined in the section on the Suggested Systems for the Generation of Abbreviations are given in italics.

TABLE 17.6.1 The Electron, Photoelectron and Related Spectroscopies

This is a major group of spectroscopies that is used in Surface Science. In some cases systematic names have been added when they differ from common usage.

	Systematic	Common Usage	Recommended
<i>Auger Electron Spectroscopy</i>	AES	AES	AES
Electron Energy Loss Spectroscopy <i>Energy-loss Electron Spectroscopy</i>	ELES	EELS	EELS
<i>High-resolution Energy-Loss Electron Spectroscopy; Vibrational Energy-Loss Electron Spectroscopy</i>	HRELES VELES	HREELS	HREELS or VEELS*
Inelastic Electron Tunnelling Spectroscopy <i>Inelastic Tunnelling Electron Spectroscopy</i>	ITES	IETS	IETS
<i>Ultraviolet Photoelectron Spectroscopy</i> <i>Outer-shell Photoelectron Spectroscopy</i>	UVPES OSPES	UPS	UPS or UPES
<i>X-ray Photoelectron Spectroscopy</i> <i>Inner-shell Photoelectron Spectroscopy</i> Electron Spectroscopy for Chemical Analysis	XPES ISPES ESCA	XPS XPES ESCA	XPS or XPES
<i>Angle-resolved Photoelectron Spectroscopy</i> <i>Angle-dispersed Photoelectron Spectroscopy</i>	ARPES ADPES	ARPS ADES	ARPS or ARPES

*The EELS technique for studying vibrational spectra of adsorbed species is of low resolution in comparison with the vibrational photon (infrared) technique for obtaining such information (RAIRS in table 17.6.2). Hence, the abbreviation HR for 'high resolution' is increasingly seen as inappropriate. VEELS, although not yet well-established, has been preferred by most of the practitioners consulted about this document.

diffuse reflectance infrared (FT) spectroscopy	DRIFT
reflection/absorption infrared spectroscopy	RAIRS
photoacoustic spectroscopy	PAS

- (c) The magnetic resonance spectroscopies have generated a particularly wide range of additional abbreviations, e.g., for free induction decay, FID; magic-angle rotation, MAR (or magic-angle spinning, MAS); cross polarization, CP; nuclear Overhauser effect, NOE; etc.

TABLE 17.6.3 Neutron and Ion Scattering (elastic, inelastic)

	Systematic	Common Usage	Recommended
Ion Neutralization Spectroscopy <i>Neutralization Ion Spectroscopy</i>	NIS	INS	INS*
Ion Scattering Spectroscopy	ISS	ISS	ISS
<i>Rutherford (Ion) Back Scattering</i>	RIBS	RBS	RBS
<i>Inelastic Neutron Scattering</i>	INS	INS	INS*

* Both abbreviations are well-established, but the context will resolve ambiguities.

TABLE 17.6.4 Mass Spectroscopy

	Systematic	Common Usage	Recommended
<i>Mass Spectroscopy</i>	MS	MS	MS
<i>Secondary Ion Mass Spectroscopy</i>	SIMS	SIMS	SIMS
<i>Field-Ion Mass Spectroscopy</i>	FIMS	FIMS	FIMS
<i>Fast-atom Bombardment (Mass Spectroscopy)</i>	FAB(MS)	FAB	FAB(MS)

TABLE 17.6.5 Other Spectroscopic Techniques

	Systematic	Common Usage	Recommended
<i>Metastable Deexcitation Spectroscopy*</i>	MDS	MDS	MDS
<i>Penning Ionization (Electron) Spectroscopy</i>	PIES	PIS	
<i>Inverse Photoelectron Spectroscopy</i>	IPES		
<i>Inverse Photoemission Spectroscopy</i>	IPES		IPES
<i>Bremsstrahlung Isochromat Spectroscopy</i>	BIS		

* This is preferred as the more general term; Penning ionization is one of two possible mechanisms.

TABLE 17.6.6 Desorption and Related Techniques

	Systematic	Common Usage	Recommended
<i>Thermal Desorption Spectroscopy</i>	TDS	TDS	
<i>Temperature Programmed Desorption</i>	TPD	TPD	TPD
<i>Temperature Programmed Reaction Spectroscopy</i>	TPRS	TPRS	TPRS
<i>Electron-stimulated Desorption</i>	ESD	ESD	ESD
<i>Photon-stimulated Desorption</i>	PSD		PSD

TABLE 17.6.7 Diffraction Techniques*

	Systematic	Common Usage	Recommended
<i>Low-Energy Electron Diffraction</i>	LEED	LEED	LEED
<i>Transmission High-Energy Electron Diffraction</i>	THEED	THEED	THEED
<i>Reflection High-Energy Electron Diffraction</i>	RHEED	RHEED	RHEED
<i>X-Ray diffraction</i>	XRD	XRD	XRD

* The abbreviation ED for electron diffraction is rarely used in isolation.

TABLE 17.6.8 Spectroscopy/Diffraction Hybrids

	Systematic	Common Usage	Recommended
<i>Photoelectron Diffraction</i>	PED		PED
<i>Extended X-Ray Absorption Fine Structure</i>	EXAFS	EXAFS	EXAFS
<i>Surface Extended X-Ray Absorption Fine Structure</i>	SEXAFS	SEXAFS	SEXAFS
<i>Near-Edge X-Ray Absorption Fine Structure</i>	NEXAFS	NEXAFS	NEXAFS
<i>X-Ray Absorption Near-Edge Fine Structure</i>	XANES	XANES	

TABLE 17.6.9 Microscopy Techniques in Surface Science

	Systematic	Common Usage	Recommended
<i>Transmission Electron Microscopy</i>	TEM	TEM	TEM
<i>Reflection Electron Microscopy</i>	REM		REM
<i>Scanning Transmission Electron Microscopy</i>	STEM	STEM	STEM
<i>Scanning Reflection Electron Microscopy</i>	SREM	SEM	SEM
<i>Field Emission (Electron) Microscopy</i>	FEEM	FEM	FEM
<i>Scanning Tunnelling (Electron) Microscopy</i>	STEM	STM	STM
<i>Field-Ion Microscopy</i>	FIM	FIM	FIM
<i>X-Ray Microscopy</i>	XRM	XRM	XRM