

## SCIENTIFIC ABBREVIATIONS AND SYMBOLS

This table lists some abbreviations, acronyms, and symbols encountered in the physical sciences. Most entries in italic type are symbols for physical quantities; for more details on these, see the table "Symbols and Terminology for Physical and Chemical Quantities" in this section. Additional information on units may be found in the table "International System of Units" in Section 1. Many of the terms to which these abbreviations refer are included in the tables "Definitions of Scientific Terms" in Section 2 and "Techniques for Materials Characterization" in Section 12. Useful references for further information are given below.

Publication practices vary with regard to the use of capital or lower case letters for many abbreviations. An effort has been made to follow the most common practices in this table, but much variation is found in the literature. Likewise, policies on the use of periods in an abbreviation vary considerably. Periods are generally omitted in this table unless they are necessary for clarity. Periods should never appear in SI units. The SI prefixes (m, k, M, etc.) are included here, but they should never be used alone. Selected combinations of these prefixes with SI units (e.g., mg, kV, MW) are also included.

A	ampere; adenine (in genetic code)
Å	ångström
A	absorbance; area; Helmholtz energy; mass number
$A_H$	Hall coefficient
$A_r$	atomic weight (relative atomic mass)
a	atto (SI prefix for $10^{-18}$ )
$a$	absorption coefficient; acceleration; activity; van der Waals constant
$a_0$	Bohr radius
A/D	analog to digital
AAA	acetoacetanilide
AAO	acetaldehyde oxime
AAS	atomic absorption spectroscopy
ABA	abscisic acid
Abe	abequose
ABL	$\alpha$ -acetylbutyrolactone
abs	absolute
Ac	acetyl; acetate
ac, AC	alternating current
Aces	2-[(2-amino-2-oxoethyl)amino]ethanesulfonic acid
ACT	activated complex theory
ACTH	adrenocorticotrophic hormone
Ad	adamantyl
Ada	[(carbamoylmethyl)imino]diacetic acid
Ade	adenine
Ado	adenosine
ADP	adenosine diphosphate
ads	adsorption
ae	eon ( $10^9$ years)
AEP	1-(2-aminoethyl)piperazine
AES	atomic emission spectroscopy; Auger electron spectroscopy
AF	audio frequency
AFM	atomic force microscopy
AI	artificial intelligence
AIBN	2,2'-azobis[isobutyronitrile]

Abbreviations are listed in alphabetical order without regard to case. Entries beginning with Greek letters fall at the end of the table.

### References

1. Mills, Ian, Ed., *Quantities, Units, and Symbols in Physical Chemistry*, Blackwell Scientific Publications, Oxford, 1993.
2. Kotyk, A., *Quantities, Symbols, Units, and Abbreviations in the Life Sciences*, Humana Press, Totawa, NJ, 1999.
3. Rhodes, P. H., *The Organic Chemist's Desk Reference*, Chapman & Hall, London, 1995.
4. Minkin, V., Glossary of Terms used in Theoretical Organic Chemistry, *Pure Appl. Chem.* 71, 1919-1981, 1999.
5. Brown, R. D., Ed., Acronyms Used in Theoretical Chemistry, *Pure Appl. Chem.* 68, 387-456, 1996.
6. *Quantities and Units, ISO Standards Handbook, Third Edition*, International Organization for Standardization, Geneva, 1993.
7. Cohen, E. R., and Giacomo, P., Symbols, Units, Nomenclature, and Fundamental Constants in Physics, *Physica* 146A, 1-68, 1987.
8. *Chemical Acronyms Database*, Indiana University, <www.oscar.chem.indiana.edu/cfdocs/libchem/acronyms/acronymsearch.html>.
9. *Acronyms and Symbols*, <www3.interscience.wiley.com/stasa/>.

AICA	5-amino-1H-imidazole-4-carboxamide
AIM	atoms in molecules (method)
AIP	aluminum isopropoxide
Al	Alfén number
Ala	alanine
alc	alcohol
ALE	atomic layer epitaxy
aliph.	aliphatic
alk.	alkaline
All	allose
Alt	altrose
AM	amplitude modulation
Am	Amyl
am	amorphous solid
AMP	adenosine monophosphate
AMPD	2-amino-2-methyl-1,3-propanediol
AMTCS	amyltrichlorosilane [trichloropentylsilane]
amu	atomic mass unit (recommended symbol is u)
AN	acetonitrile
anh, anhyd	anhydrous
ANOVA	analysis of variance
antilog	antilogarithm
ANTU	1-naphthalenylthiourea
AO	atomic orbital
AOM	angular overlap model
APAD	3-acetylpyridine adenine dinucleotide
Api	apiose
APM	atomic probe microanalysis
APS	appearance potential spectroscopy; adenosine phosphosulfate
APW	augmented plane wave
aq	aqueous
Ar	aryl
Ara	arabinose
Ara-ol	arabinitol
Arg	arginine

ARPES	angular resolved photoelectron spectroscopy	BPB	bromophenol blue
ASC	4-(acetylamino)benzenesulfonyl chloride	BPG	2,3-bis(phospho)- <i>D</i> -glycerate
ASCI	American National Standard Code for Information Interchange	bpy	2,2'-bipyridine
ASE	aromatic stabilization model	Bq	becquerel
Asn	asparagine	Br	butyryl
Asp	aspartic acid	BRE	bond resonance energy
at	atomization	BrUrd	5-bromouridine
ATEE	<i>N</i> -acetyl- <i>L</i> -tyrosine ethyl ester	BSSE	basis set superposition error
ATLC	adsorption thin layer chromatography	BTMSA	1,2-bis(trimethylsilyl)acetylene
atm	standard atmosphere	Btu	British thermal unit
ATP	adenosine triphosphate	BTX	benzene, toluene, and xylene
ATR	attenuated total internal reflection	Bu	butyl
at.wt.	atomic weight	bu	bushel
AU	astronomical unit (ua is also used)	Bz	benzoyl
av	average	Bzl	benzyl
avdp	avoirdupois	C	coulomb; cytosine (in genetic code)
B	bel	°C	degree Celsius
<i>B</i>	magnetic flux density; second virial coefficient; susceptance	<i>C</i>	capacitance; heat capacity; number concentration
b	barn	<i>c</i>	centi (SI prefix for 10 <sup>-2</sup> ); combustion reaction amount concentration; specific heat; velocity
<i>b</i>	van der Waals constant; molality	<i>c</i> <sub>0</sub>	speed of light in vacuum
BA	benzyladenine	ca.	approximately
BAL	British anti-Lewisite [2,3-dimercapto-1-propanol]	cal	calorie
BAP, BaP	benzo[a]pyrene	calc	calculated
bar	bar (pressure unit)	cAMP	adenosine cyclic 3',5'-(hydrogen phosphate)
bbl	barrel	CAN	ceric ammonium nitrate
BBP	benzyl butyl phthalate	CARS	coherent anti-Stokes Raman spectroscopy
BCB	bromocresol blue	CAS	complete active space
bcc	body centered cubic	CASRN	Chemical Abstracts Service Registry Number
BCG	bromocresol green	CAT	computerized axial tomography; clear air turbulence
BCNU	<i>N,N'</i> -bis(2-chloroethyl)- <i>N</i> -nitrosourea	CBE	chemical beam epitaxy
BCP	bromocresol purple	CBS	complete basis set (of orbitals)
BCPB	bromochlorophenol blue	CC	coupled cluster
BCS	Bardeen-Cooper-Schrieffer (theory)	cc	cubic centimeter (mL)
BDE	bond dissociation energy	CCD	charge-coupled device
BDEA	butyldiethanolamine	CD	circular dichroism
BDMA	benzyl dimethylamine	cd	candela; condensed (phase)
Bé	Baumé	CDNO	complete neglect of differential overlap
BEBO	bond energy bond order (method)	CDP	cytidine 5'-diphosphate
BEI	biological exposure index	CDT	1,5,9-cyclododecatriene
Bes	2-[bis(2-hydroxyethyl)amino]ethanesulfonic acid	CDTA	(1,2-cyclohexylenedinitrilo)tetraacetic acid monohydrate
BET	Brunauer-Emmett-Teller (isotherm)	CDW	charge density waves
BeV	billion electronvolt (GeV)	CEP	counter electrophoresis
BGE	butyl glycidyl ether	CEPA	coupled electron-pair approximation
BHA	<i>tert</i> -butyl-4-hydroxyanisole	cf.	compare
BHC	benzene hexachloride [hexachlorobenzene]	cfm	cubic feet per minute
Bhn	Brinell hardness number	cgs	centimeter-gram-second system
BHT	butylated hydroxytoluene [2,6-di- <i>tert</i> -butyl-4-methylphenol]	Chaps	3-[3-(cholamidopropyl)dimethylammonio]-1-propanesulfonic acid
Bi	biot	Ches	2-( <i>N</i> -cyclohexylamino)ethanesulfonic acid
Bicine	<i>N,N</i> -bis(2-hydroxyethyl)glycine	CHF	coupled Hartree-Fock (method)
Bistris	2-[bis(2-hydroxyethyl)amino]-2-(hydroxymethyl)propane-1,3-diol	Chl	chlorophyll
Bistris-propane	1,3-bis[tris(hydroxymethyl)methylamino]propane	Cho	choline
BLO	γ-butyrolactone	CHT	1,3,5-cycloheptatriene
BN	bond number; benzonitrile	Ci	curie
BNS	nuclear backscattering spectroscopy	CI	configuration interaction; chemical ionization, color index
BO	Born-Oppenheimer (approximation); bond order	CIDEP	chemically induced dynamic electron polarization
BOD	biochemical oxygen demand	CIDNP	chemically induced dynamic nuclear polarization
BON	β-hydroxynaphthoic acid	CIE	countercurrent immunoelectrophoresis
bp	boiling point	cir	circular
		CKFF	Cotton-Kraihanzel force field

CL	cathode luminescence (spectroscopy)	DACH	<i>trans</i> -1,2-diaminocyclohexane
cm	centimeter	DAP	diammonium phosphate
c.m.	center of mass	dB	decibel
c.m.c.	critical micelle concentration	DBA	dibenz[a,h]anthracene
CMO	canonical molecular orbital	DBCP	1,2-dibromo-3-chloropropane
CMP	cytidine 5'-monophosphate	DBMS	database management system
CN	coordination number	DBP	dibutyl phthalate
CNDO	complete neglect of differential overlap	DBPC	2,6-di- <i>tert</i> -butyl- <i>p</i> -cresol
<i>Co</i>	Cowling number	dc, DC	direct current
COD	chemical oxygen demand; 1,4-cyclooctadiene	DCB	dicyanobenzene
conc	concentrated; concentration	DCEE	dichloroethyl ether
const	constant	DCHA	dicyclohexylamine
COOP	crystal orbital overlap population	DCM	dichloromethane
cos	cosine	DCPD	dicyclopentadiene
cosh	hyperbolic cosine	DE	delocalization energy
COSY	correlation spectroscopy	Dec	decyl
COT	1,3,5,7-cyclooctatetraene	dec	decomposes
cot	cotangent	DEET	diethyltoluamide [ <i>N,N</i> -diethyl-3-methylbenzamide]
coth	hyperbolic cotangent	deg	degree
CP	chemically pure	den	density
Cp	cyclopentadienyl	det	determinant
cP	centipoise	dev	deviation
cp	candle power	DFT	density functional theory
CPA	coherent potential approximation	dGlc	2-deoxyglucose
CPC	centrifugal partition chromatography	DHU	dihydrouridine
cpd	contact potential difference	diam	diameter
CPR	chlorophenol red	dil	dilute; dilution
cps	cycles per second	DIM	diatomics in molecules (method); digital imaging microscopy
CPT	charge conjugation/space inversion/time inversion (theorem)	dm	decimeter
CPU	central processing unit	DMA	<i>N,N</i> -dimethylaniline
cr, cryst	crystalline (phase)	DMAC	<i>N,N</i> -dimethylacetamide
CRU	constitutional repeating unit (in polymer nomenclature)	DMF	<i>N,N</i> -dimethylformamide
CSA	camphorsulfonic acid	DMP	dimethyl phthalate
csc	cosecant	DMS	dimethyl sulfide
CT	charge transfer	DMSO	dimethyl sulfoxide
ct	carat	DMT	dimethyl terephthalate; dimethyl tartrate
CTEM	conventional transmission electron microscopy	DNA	deoxyribonucleic acid
CTP	cytidine 5'-triphosphate	DNase	deoxyribonuclease
CTR	controlled thermonuclear reaction	DNMR	dynamic NMR spectroscopy
cu	cubic	DNP	dinitropyrene
CV	cyclic voltammetry	Dod	dodecyl
CVD	chemical vapor deposition	DOP	dioctyl phthalate
cw	continuous wave	DOS	density of states; digital operating system
cwt	hundredweight (112 pounds)	doz	dozen
Cy	cyclohexyl	d.p.	degree of polymerization
Cyd	cytidine	dpl	displacement
cyl	cylinder	dpm	disintegrations per minute
Cys	cysteine	dps	disintegrations per second
Cyt	cytosine	dr	dram
D	debye unit	DRE	Dewar resonance energy
<i>D</i>	diffusion coefficient; dissociation energy; electric displacement	dRib	2-deoxyribose
d	day; deuteron; deci (SI prefix for 10 <sup>-1</sup> )	DRIFT	diffuse reflectance infrared Fourier transform
<i>d</i>	distance; density; dextrorotatory	DRP	dynamic reaction path
2,4-D	2,4-dichlorophenoxyacetic acid	DRS	diffuse reflectance spectroscopy
D/A	digital to analog	DSC	differential scanning calorimetry
Da	dalton	DTA	differential thermal analysis
DA	donor-acceptor (complex)	DTBP	di- <i>tert</i> -butyl peroxide
da	deka (SI prefix for 10 <sup>1</sup> )	DVB	divinylbenzene
DAA	diacetone alcohol	dyn	dyne
DAB	4-(dimethylamino)azobenzene	DZ	double-zeta (type of basis set)
		E	exa (SI prefix for 10 <sup>18</sup> )

<i>E</i>	electric field strength; electromotive force; energy; modulus of elasticity; entgegen ( <i>trans</i> configuration)	FEL	free electron laser
$E_h$	Hartree energy	FEM	field emission microscopy
<i>e</i>	electron; base of natural logarithms	FEMO	free electron molecular orbital
<i>e</i>	elementary charge; linear strain	FET	field effect transistor
EA	electron affinity	fid	free induction decay
EAN	effective atomic number	FIM	field ion microscopy
ECP	effective core potential	FIR	far infrared
ECR	electron cyclotron resonance	fl	fluid (phase)
ED	electron diffraction	FM	frequency modulation
EDAX	energy dispersive analysis by x-rays	<i>F<sub>o</sub></i>	Fourier number
EDB	ethylene dibromide [1,2-dibromoethane]	fp	freezing point
EDC	ethylene dichloride [1,2-dichloroethane]	fpm	feet per minute
EDS	energy-dispersive x-ray spectroscopy	fps	feet per second; foot-pound-second system
EDTA	ethylenediaminetetraacetic acid	Fr	franklin
EELS	electron energy loss spectroscopy	<i>Fr</i>	Froude number
EFF	empirical force field	Fru	fructose
EFFF	energy factored force field	FSGO	floating spherical gaussian orbitals
EHMO,	extended Hückel molecular orbital (theory)	FT	Fourier transform
EHT		ft	foot
EIS	electron impact spectroscopy; electrochemical impedance spectroscopy	ft-lb	foot pound
ELS	energy loss spectroscopy	FTIR	Fourier transform infrared spectroscopy
EM	extended molarity; electron microscopy	FTMS	Fourier transform mass spectrometry
emf	electromotive force	FTNMR	Fourier transform nuclear magnetic resonance
EMPA,	electron probe microanalysis	fus	fusion (melting)
EMA		FVP	flash vacuum pyrolysis
emu	electromagnetic unit system	G	gauss; guanine (in genetic code); giga (SI prefix for 10 <sup>9</sup> )
en	ethylenediamine	<i>G</i>	electrical conductance; Gibbs energy; gravitational constant; sheer modulus
ENDOR	electron-nuclear double resonance	g	gram; gas (phase)
EOS	equation of state	<i>g</i>	acceleration due to gravity; degeneracy; Landé g-factor; statistical weight
EPR	electron paramagnetic resonance	GABA	γ-aminobutyric acid
EPTC	dipropylcarbamothioic acid, <i>S</i> -ethyl ester	Gal	gal; galactose
eq, eqn	equation	gal	gallon
<i>eqQ</i>	quadrupole coupling constant	GalN	galactosamine
erf	error function	GC	gas chromatography
erg	erg (energy unit)	GC-MS	gas chromatography-mass spectroscopy
ESCA	electron spectroscopy for chemical analysis	GDMS	glow discharge mass spectroscopy
ESD	electron stimulated desorption	GDP	guanosine 5'-diphosphate
e.s.d.	estimated standard deviation	<i>gem</i>	geminal (on the same carbon atom)
ESR	electron spin resonance	GeV	gigaelectronvolt
est	estimated	GIAO	gauge invariant atomic orbital
esu	electrostatic unit system	gl	glacial
ET	ephemeris time; electron transfer	GLC	gas-liquid chromatography
Et	ethyl	Glc	glucose
Etn	ethanolamine	GlcA	gluconic acid
ETS	electron tunneling spectroscopy	GlcN	glucosamine
<i>Eu</i>	Euler number	GlcNAc	<i>N</i> -acetylglucosamine
e.u.	entropy unit	GlcU	glucuronic acid
eV	electronvolt	Gln	glutamine
EXAFS	extended x-ray absorption fine structure (spectroscopy)	Glu	glutamic acid
EXELFS	extended energy loss fine structure	Gly	glycine
exp	exponential function	GMP	guanosine 5'-monophosphate
expt	experimental	GMT	Greenwich mean time
ext	external	gpm	gallons per minute
F	farad	gps	gallon per second
°F	degree Fahrenheit	<i>Gr</i>	Grashof number
<i>F</i>	Faraday constant; force; angular momentum	gr	grain
f	formation reaction; femto (SI prefix for 10 <sup>-15</sup> )	Gra	glyceraldehyde
<i>f</i>	activity coefficient; aperture ratio; focal length; force constant; frequency; fugacity	Gri	glyceric acid
FAD	flavine adenine dinucleotide	Grn	glycerone [dihydroxyacetone]
fcc	face centered cubic	Gro	glycerol
		GTO	gaussian-type orbital

GTP	guanosine 5'-triphosphate	ID	inside diameter
Gua	guanine	id	ideal (solution)
Gul	gulose	Ido	iodose
Guo	guanosine	IdoA	iduronic acid
GUT	grand unified theory	IDP	inosine 5'-diphosphate
GVB	generalized valence bond (method)	IE	ionization energy
GWS	Glashow-Weinberg-Salam (theory)	i.e.p.	isoelectric point
Gy	gray; gigayear	IEPA	independent electron pair approximation
H	henry	IF	intermediate frequency
<i>H</i>	enthalpy; Hamiltonian function; magnetic field	IGLO	individual gauge for localized orbitals
$H_0$	Hubble constant	Ile	isoleucine
h	helion; hour; hecto (SI prefix for 10 <sup>2</sup> )	Im	imaginary part
<i>h</i>	Planck constant	IMFP	inelastic mean free path (of electrons)
<i>Ha</i>	Hartmann number	imm	immersion
ha	hectare	IMP	inosine 5'-monophosphate
HAM	hydrogenic atoms in molecules	IMPATT	impact ionization avalanche transit time
hav	haversine	in.	inch
Hb	hemoglobin	INDO	immediate neglect of differential overlap
HCA	heterocyclic amine	Ino	inosine
hcp	hexagonal closed packed	INS	inelastic neutron scattering; ion neutralization spectroscopy
HDL	high-density lipoprotein	Ins	<i>myo</i> -inositol
HEIS	high-energy ion scattering	int	internal
HEP	high energy physics	IP	ionization potential
Hepes	4-(2-hydroxyethyl)-1-piperazineethanesulfonic acid	IPA	isopropyl alcohol
Hepps	4-(2-hydroxyethyl)-1-piperazinepropanesulfonic acid	IPMA	ion probe microanalysis
HF	high frequency; Hartree-Fock (method)	IPN	interpenetrating polymer network
HFA	hexafluoroacetone	IPR	isotope perturbation of resonance
HFO	Hartree-Fock orbital	IPTS	International Practical Temperature Scale
hfs	hyperfine structure	IQ	2-amino-3-methyl-3 <i>H</i> -imidazo(4,5- <i>f</i> )quinoline
His	histidine	IR	infrared
HMO	Hückel molecular orbital	IRAS	infrared reflection-absorption spectroscopy
HMX	cyclotetramethylenetetranitramine	IRC	intrinsic reaction coordinate
HN1	2-chloro- <i>N</i> -(2-chloroethyl)- <i>N</i> -ethylethanamine	IRS	infrared spectroscopy
HOAc	acetic acid	isc	intersystem crossing
HOC	halogenated organic compound(s)	ISE	ion-selective electrode; isodesmic stabilization energy
HOMAS	harmonic oscillator model of aromatic stabilization	ISS	ion scattering spectroscopy
HOMO	highest occupied molecular orbital	ITP	inosine 5'-triphosphate
HOSE	harmonic oscillator stabilization energy	ITS	International Temperature Scale (1990)
Hp	heptyl	IU	international unit
hp	horsepower	J	joule
HPLC	high-performance liquid chromatography	<i>J</i>	angular momentum; electric current density; flux; Massieu function
HQ	<i>p</i> -hydroquinone	<i>j</i>	angular momentum; electric current density
hr	hour	JT	Jahn-Teller (effect)
HRE	Hückel resonance energy	K	kelvin
HREELS	high resolution electron energy loss spectroscopy	<i>K</i>	absorption coefficient; bulk modulus; equilibrium constant; kinetic energy
HREM	high resolution electron microscopy	k	kilo (SI prefix for 10 <sup>3</sup> )
HSAB	hard-soft acid-base (theory)	<i>k</i>	absorption index; Boltzmann constant; rate constant; thermal conductivity; wave vector
HSE	homodesmotic stabilization energy	kat	katal (unit of catalytic activity)
Hx	hexyl	kb	kilobar; kilobases (DNA or RNA)
Hyp	hypoxanthine	kcal	kilocalorie
Hz	hertz	KE	kinetic energy
I	inositol	keV	kiloelectronvolt
<i>I</i>	electric current; ionic strength; moment of inertia; nuclear spin angular momentum; radiant intensity	kg	kilogram
<i>i</i>	square root of minus one	kgf	kilogram force
<i>i</i>	electric current	KIE	kinetic isotope effect
I/O	input/output	kj	kilojoule
IAT	international atomic time	km	kilometer
IC	integrated circuit	<i>Kn</i>	Knudsen number
ICD	induced circular dichroism	kPa	kilopascal
ICP	inductive-coupled plasma		
ICR	ion cyclotron resonance		

kt	karat	<i>m</i>	magnetic dipole moment; mass; molality; angular momentum component; <i>meta</i> (locant on aromatic ring)
kV	kilovolt	<i>Ma</i>	Mach number
kva	kilovolt ampere	MA	maleic anhydride
kW	kilowatt	Mal	maltose
kwh	kilowatt hour	Man	mannose
L	liter; lambert	MASNMR	magic angle spinning nuclear magnetic resonance
<i>L</i>	Avogadro constant; inductance; Lagrange function; angular momentum	max	maximum
l	liter; liquid (phase)	Mb	myoglobin
<i>l</i>	angular momentum; length; mean free path; levorotatory	MBE	molecular beam epitaxy
Lac	lactose	MBER	molecular beam electron resonance
LAH	lithium aluminum hydride	MBPT	many body perturbation theory
lat.	latitude	MC	Monte Carlo (method)
lb	pound	MCAA	monochloroacetic acid
lb	pound force	MCD	magnetic circular dichroism
LC	liquid chromatography	MCPA	(4-chloro-2-methylphenoxy)acetic acid
lc	liquid crystal (phase)	MCPF	modified coupled pair functional
LCAO	linear combination of atomic orbitals	MCSCF	multiconfigurational self-consistent field (approximation)
LD	lethal dose	MD	molecular dynamics (method)
LDA	local density approximation; lithium diisopropylamide	Me	methyl
LDL	low-density lipoprotein	MeCCNU	1-(2-chloroethyl)-3-(4-methylcyclohexyl)-1-nitrosourea
LDV	laser-Doppler velocimetry	MeIQ	2-amino-3,4-dimethylimidazo[4,5-f]quinoline
<i>Le</i>	Lewis function	MeIQx	2-amino-3,8-dimethylimidazo[4,5-f]quinoxaline
LE	localization energy	MEK	methyl ethyl ketone
LEC	liquid exchange chromatography	MEP	molecular electrostatic potential
LED	light emitting diode	MERP	minimum energy reaction path
LEED	low-energy electron diffraction	Mes	4-morpholineethanesulfonic acid
LEIS	low-energy ion scattering	MESFET	metal-semiconductor field-effect transistor
Leu	leucine	Met	methionine
LFER	linear free energy relationships	MeV	megaelectronvolt
LFL	lower flammable limit	meV	millielectronvolt
lim	limit	MF	molecular formula
LIMS	laser ionization mass spectroscopy; laboratory information management system	mg	milligram
liq	liquid	MHD	magnetohydrodynamics
LLCT	ligand to ligand charge transfer	mi	mile
lm	lumen	min	minimum; minute
LMCT	ligand to metal charge transfer	MINDO	modified INDO (method)
LMO	localized molecular orbital	MIPK	methyl isopropyl ketone
LMR	laser magnetic resonance	MIR	mid infrared
ln	logarithm (natural)	misc	miscible
LNDO	local neglect of differential overlap	MKS	meter-kilogram-second system
log	logarithm (common)	MKSA	meter-kilogram-second-ampere system
LOMO	lowest occupied molecular orbital	mL, ml	milliliter
long.	longitude	MM	molecular mechanics
LSFE	linear field stabilization energy	mm	millimeter
LST	local sidereal time	MMDR	microwave-microwave double resonance
LT	local time	mmf	magnetomotive force
LTE	local thermodynamic equilibrium	mmHg	millimeter of mercury
LUMO	lowest unoccupied molecular orbital	MNDO	modified neglect of diatomic overlap
lx	lux	MO	molecular orbital; methyl orange
ly	langley	MODR	microwave-optical double resonance
l.y.	light year	mol	mole
Lys	lysine	mol.wt.	molecular weight
Lyx	lyxose	mon	monomeric form
M	molar (as in 0.1 M solution); mega (SI prefix for 10 <sup>6</sup> )	Mops	4-morpholinepropanesulfonic acid
<i>M</i>	magnetization; molar mass; mutual inductance; torque; angular momentum component; median	MOS	metal-oxide semiconductor
<i>M<sub>r</sub></i>	molecular weight (relative molar mass)	MOSFET	metal-oxide semiconductor field-effect transistor
m	meter; molal (as in 0.1 m solution); metastable (isotope); milli (SI prefix for 10 <sup>-3</sup> )	mp	melting point
		MPa	megapascal
		MPA	Mulliken population analysis

Mpc	megaparsec	OFGF	outer valence Green's function (method)
MPTP	1,2,3,6-tetrahydro-1-methyl-4-phenylpyridine	ORD	optical rotatory dispersion
MR	methyl red	Oro	orotate; orotidine
MRD	multireference double substitution (method)	oz	ounce
MRI	magnetic resonance imaging	P	poise; peta (SI prefix for 10 <sup>15</sup> )
mRNA	messenger RNA	<i>P</i>	power; pressure; probability; sound energy flux
MS	mass spectroscopy	<i>p</i>	proton; pico (SI prefix for 10 <sup>-12</sup> )
ms	millisecond	<i>p</i>	dielectric polarization; electric dipole moment; momentum; pressure; bond order; <i>para</i> (as aromatic ring locant)
MSA	methanesulfonic acid	Pa	pascal
MSDS	Material Safety Data Sheet	PA	proton affinity
MSL	mean sea level	PABA	<i>p</i> -aminobenzoic acid
MTBE	methyl <i>tert</i> -butyl ether	PAH	polycyclic aromatic hydrocarbon(s)
Mur	muramic acid	PAM	polyacrylamide
mV	millivolt	PAN	1-(2-pyridylazo)-2-naphthol; polyacrylonitrile
MVK	methyl vinyl ketone	PAR	4-(2'-pyridylazo)resorcinol
MW	megawatt; microwave; molecular weight	PAS	photoacoustic spectroscopy
mW	milliwatt	PBA	poly(butyl acrylate)
Mx	maxwell	PBB	polybrominated biphenyl
N	newton	PBD	poly(1,3-butadiene)
<i>N</i>	angular momentum; neutron number; number density	PBMA	poly(butyl methacrylate)
<i>N<sub>A</sub></i>	Avogadro constant	PBT	poly(butylene terephthalate)
<i>n</i>	neutron; nano (SI prefix for 10 <sup>-9</sup> )	PC	paper chromatography
<i>n</i>	amount of substance; number density; principal quantum number; refractive index; normal (in chemical formulas)	pc	parsec
NAA	nuclear activation analysis	PCM	polarizable continuum model
NAAD	nicotinic acid adenine dinucleotide	PCR	polymerase chain reaction
NAD	nicotinamide adenine dinucleotide	PD	potential difference
NADH	reduced NAD	pdl	poundal
NADP	NAD phosphate	PDMS	poly(dimethylsiloxane)
NANA	<i>N</i> -acetylneuraminic acid	Pe	pentyl
NAO	natural atomic orbital	<i>Pe</i>	Péclet number
NBO	natural bond orbital	pe	probable error
nbp	normal boiling point	PEA	poly(ethyl acrylate)
NEDOR	nuclear electron double resonance	PEG	poly(ethylene glycol)
Neu	neuraminic acid	PEL	permissible exposure limit
NEXAFS	near-edge x-ray absorption fine structure	PES	photoelectron spectroscopy; potential energy surface
ng	nanogram	PET	positron emission tomography; poly(ethylene terephthalate)
NHO	natural hybrid orbital	peth	petroleum ether
NICS	nuclear independent chemical shift	pf	power factor
NIR	near infrared; ribosylnicotinamide	PFOA	perfluorooctanoic acid
nm	nanometer	pg	picogram
NMN	β-nicotinamide mononucleotide	Ph	phenyl
NMR	nuclear magnetic resonance	pH	negative log of hydrogen ion concentration
Nn	nonyl	Phe	phenylalanine
NNDO	neglect of nonbonded differential overlap	PhIP	2-amino-1-methyl-6-phenylimidazo[4,5-b]pyridine
NO	natural orbital	pl	isoelectric point
NOE	nuclear Overhauser effect	PIB	polyisobutylene
NOx	nitrogen oxides	Pipes	1,4-piperazinediethanesulfonic acid
NP	nitropyrene	PIV	particle-image velocimetry
NPA	natural population analysis	PIXE	particle induced x-ray emission
NQR	nuclear quadrupole resonance	p <i>K</i>	negative log of ionization constant
NRA	nuclear reaction analysis	PLM	principle of least motion
ns	nanosecond	pm	picometer
NSE	neutron spin echo	PMA	poly(methyl acrylate)
NTP	normal temperature and pressure	PMMA	poly(methyl methacrylate)
Nu	nucleophile	PMO	perturbation MO (theory)
<i>Nu</i>	Nusselt number	PNDO	partial neglect of differential overlap
<i>o</i>	<i>ortho</i> (locant on aromatic ring)	PNO	pair natural orbitals
obs, obsd	observed	PNRA	prompt nuclear reaction analysis
Oc	octyl	POAV	π-orbital axis vector
OD	optical density; outside diameter	pol	polymeric form
Oe	oersted		

POx	phosphorus oxides	Rha	rhamnose
ppb	parts per billion	RHEED	reflection high-energy electron diffraction
ppm	parts per million	RHF	restricted Hartree-Fock (theory)
PPO	poly(phenylene oxide)	RIA	radioimmunoassay
PPP	Pariser-Parr-Pople (method)	Rib	ribose
ppt	parts per thousand; precipitate	Ribulo	ribulose
Pr	propyl	rms	root-mean-square
<i>Pr</i>	Prandtl number	RNA	ribonucleic acid
PRDDO	partial retention of diatomic differential overlap	RNase	ribonuclease
Pro	proline	ROHF	restricted open shell Hartree-Fock
PS	photoelectron spectroscopy	ROM	read only memory
ps	picosecond	RPA	random phase approximation
PSD	photon stimulated desorption	RPH	reaction path Hamiltonian
psi	pounds per square inch	RPLC	reversed-phase liquid chromatography
psia	pounds per square inch absolute	rpm	revolutions per minute
psig	pounds per square inch gage	rps	revolutions per second
PT	perturbation theory	RRK	Rice-Ramsperger-Kassel (theory)
pt	pint	RRKM	Rice-Ramsperger-Kassel-Marcus (theory)
PTMS	propyltrimethoxysilane	rRNA	ribosomal RNA
Pu	purine	RRS	resonance Raman spectroscopy
PVA	poly(vinyl alcohol)	RS	Raman spectroscopy
PVAc	poly(vinyl acetate)	Ry	rydberg
PVC	poly(vinyl chloride)	S	siemens
PVDF	poly(vinylidene fluoride)	<i>S</i>	area; entropy; probability current density; Poynting vector; symmetry coordinate; spin angular momentum
PVME	poly(methyl vinyl ether)	<i>s</i>	second; solid (phase)
PVT	pressure-volume-temperature	<i>s</i>	path length; spin angular momentum; symmetry number; sedimentation coefficient; solubility; symmetrical (as stereochemical descriptor)
Py	pyrimidine	SALC	symmetry adapted linear combinations
Q	electric charge; heat; partition function; quadrupole moment; radiant energy; vibrational normal coordinate	SALI	surface analysis by laser ionization
<i>q</i>	electric field gradient; flow rate; heat; wave vector (phonons)	SAM	scanning Auger microscopy
QCD	quantum chromodynamics	SAMS	self-assembled monolayers
QCI	quadratic configuration interaction	SANS	small angle neutron scattering
QED	quantum electrodynamics	Sar	sarcosine
Q.E.D.	quod erat demonstrandum (which was to be proved)	sat, satd	saturated
QMRE	quantum mechanical resonance energy	SAXS	small angle x-ray scattering
QSAR	quantitative structure-activity relations	Sc	Schmidt number
QSO	quasi-stellar object	SC	spin-coupled (method)
qt	quart	SCD	state correlation diagram
quad	quadrillion BTU (=1.055•10 <sup>18</sup> joules)	SCE	saturated calomel electrode
Qui	quinovose	SCF	self-consistent field (method)
q.v.	quod vide (which you should see)	SCR	silicon-controlled rectifier
R	roentgen; alkyl radical (in chemical formulas)	SCRF	self-consistent reaction field (method)
°R	degree Rankine	sd	standard deviation
<i>R</i>	electrical resistance; gas constant; molar refraction; Rydberg constant; coefficient of multiple correlation	SDW	spin density wave
<i>r</i>	reaction (as in $\Delta_r H$ )	SE	strain energy
<i>r</i>	position vector; radius	sec	secant; second
RA	right ascension	<i>sec</i>	secondary (in chemical name)
rad	radian	SECSY	spin-echo correlated spectroscopy
RAIRS	reflection-absorption infrared spectroscopy	Sed	sedoheptulose
RAM	random access memory	SEELFS	surface extended energy loss fine structure
RBS	Rutherford back scattering	SEM	scanning electron microscopy; standard error of the mean
Rbu, Rul	ribulose	sepn	separation
RCI	ring current index	Ser	serine
RDA	rubidium dihydrogen arsenate	SERS	surface-enhanced Raman spectroscopy
Re	real part	SET	single electron transfer
RE	resonance energy	SEXAF	surface extended x-ray absorption fine structure
RED	radial electron distribution	SFC	supercritical fluid chromatography
REM	reflection electron microscopy	<i>Sh</i>	Sherwood number
rem	roentgen equivalent man	Shy	thiohypoxanthine
REPE	resonance energy per electron	SI	International System of Units
RF	radiofrequency		



SILAR	successive ionic layer adsorption and reaction	Tes	2-[[2-hydroxy-1,1-bis(hydroxymethyl)ethyl]amino]-1-propanesulfonic acid
SIMS	secondary-ion spectroscopy	TFD	Thomas-Fermi-Dirac (method)
sin	sine	TGA	thermogravimetric analysis
sinh	hyperbolic sine	Thd	ribosylthymine
SIPN	semi-interpenetrating polymer network	theor	theoretical
SLAM	scanning laser acoustic microscopy	thf, THF	tetrahydrofuran
SMO	semiempirical molecular orbital	Thr	threonine
SMOW	Standard Mean Ocean Water	Thy	thymine
SNMS	sputtered neutral mass spectroscopy	TL	thermoluminescence
Sno	thiouridine	TLC	thin-layer chromatography
SNU	solar neutrino unit	TLV	threshold limit value
SOJT	second-order Jahn-Teller (effect)	TM	transverse magnetic
sol	soluble; solution	TMAB	tetrabutylammonium bromide
soln, sln	solution	TMS	tetramethylsilane
SOMO	singly occupied molecular orbital	tol	tolyl
Sor	sorbose	TOPO	trioctylphosphine oxide
sp gr	specific gravity	Torr	torr (pressure unit)
SPM	scanned probe microscopy	Tre	trehalose
sq	square	TRE	topological resonance energy
<i>Sr</i>	Strouhal number	Tricine	<i>N</i> -[2-hydroxy-1,1-bis(hydroxymethyl)ethyl]glycine
sr	steradian	Tris	2-amino-2-(hydroxymethyl)-1,3-propanediol
Srd	6-thioinosine	tRNA	transfer RNA
SSMS	source spark mass spectroscopy	Trp	tryptophan
St	stoke	trs	transition
<i>St</i>	Stanton number	TS	transition state
std, stnd	standard (state)	TSS	transition state spectroscopy
STEL	short-term exposure limit	Tyr	tyrosine
STEM	scanning transmission electron microscope	U	uracil (in genetic code)
STM	scanning tunneling microscopy	<i>U</i>	electric potential difference; internal energy
STO	Slater-type orbital	u	unified atomic mass unit
STP	standard temperature and pressure	<i>u</i>	Bloch function; electric mobility; velocity
sub, sub1	sublimes; sublimation	ua	astronomical unit (AU is also used)
Suc, Sac	sucrose	UBFF	Urey-Bradley force field
Sur	thiouracil	UDMH	1,1-dimethylhydrazine
Sv	sievert	UDP	uridine 5'-diphosphate
T	tesla; tera (SI prefix for 10 <sup>12</sup> )	UHF	ultrahigh frequency; unrestricted Hartree-Fock (method)
<i>T</i>	kinetic energy; period; term value; temperature (thermodynamic); torque; transmittance	UMP	uridine 5'-monophosphate
t	metric tonne; triton	<i>uns, unsym</i>	unsymmetrical (as chemical descriptor)
<i>t</i>	Celsius temperature; thickness; time; transport number	UPS, UPES	ultraviolet photoelectron spectroscopy
Tal	talose	Ura	uracil
tan	tangent	Urd	uridine
tanh	hyperbolic tangent	USP	United States Pharmacopeia
Taps	3-[[2-hydroxy-1,1-bis(hydroxymethyl)ethyl]amino]-1-propanesulfonic acid	UT	universal time
TBE	1,1,2,2-tetrabromoethane	UTP	uridine 5'-triphosphate
TBP	tributyl phosphate	UV	ultraviolet
TCA	trichloroacetic acid	V	volt
TCE	trichloroethylene	<i>V</i>	electric potential; potential energy; volume
TCNQ	tetracyanoquinodimethane	<i>v</i>	reaction rate; specific volume; velocity; vibrational quantum number; vicinal (as chemical descriptor)
TCP	tricresyl phosphate	v/v	volume per volume (volume of solute divided by volume of solution, expressed as percent)
TCSCF	two configuration self-consistent field	Val	valine
TDI	toluene diisocyanate	vap	vaporization
tDNA	transfer DNA	VAT	vibration assisted tunneling
TE	transverse electric	VB	valence band; valence bond (theory)
TEA	triethanolamine; triethylamine	VCD	vibrational circular dichroism
TED	transferred electron device; transmission electron diffraction	VDW	van der Waals interaction
TEM	transverse electromagnetic; transmission electron microscope	VHF	very high frequency
temp	temperature	<i>vic</i>	vicinal (on adjacent carbon atom)
<i>tert</i>	tertiary (in chemical name)	VIS	visible region of the spectrum
		vit	vitreous (phase)

VOC	volatile organic compound(s)	$\beta$	beta particle
VOFF	valence orbital force field	$\beta$	reciprocal temperature parameter ( $= 1/kT$ )
VPC	vapor phase chromatography	$\gamma$	photon; gamma (obsolete mass unit = $\mu\text{g}$ )
VSEPR	valence shell electron-pair repulsion (method)	$\gamma$	activity coefficient; conductivity; magnetogyric ratio; mass concentration; ratio of heat capacities; surface tension
VSIP	valence state ionization potential	$\Gamma$	Grüneisen parameter; level width; surface concentration
VSLI	very large scale integrated (circuit)	$\delta$	chemical shift; Dirac delta function; Kronecker delta; loss angle
VUV	vacuum ultraviolet	$\Delta$	inertial defect; mass excess
W	watt	$\varepsilon$	emittance; Levi-Civita symbol; linear strain; molar absorption coefficient; permittivity
$W$	radiant energy; statistical weight; work	$\zeta$	Coriolis coupling constant; electrokinetic potential
$w$	energy density; mass fraction; velocity; work	$\eta$	overpotential; viscosity
$w/v$	weight per volume (mass of solute divided by volume of solution, usually expressed as g/100 mL)	$\kappa$	compressibility; conductivity; magnetic susceptibility; molar absorption coefficient
$w/w$	weight per weight (mass of solute divided by mass of solution, expressed as percent)	$\lambda$	absolute activity; radioactive decay constant; thermal conductivity; wavelength
WAXS	wide angle x-ray scattering	$\Lambda$	angular momentum; ionic conductivity
Wb	weber	$\mu$	muon; micro (SI prefix for $10^{-6}$ )
$W_e$	Weber number	$\mu$	chemical potential; electric dipole moment; electric mobility; friction coefficient; Joule-Thompson coefficient; magnetic dipole moment; mobility; permeability
WKB	Wentzel-Kramers-Brillouin (approximation)	$\mu\text{F}$	microfarad
WLF	Williams-Landel-Ferry (equation)	$\mu\text{g}$	microgram
wt	weight	$\mu\text{m}$	micrometer
X	X unit; halogen (in chemical formula)	$\mu\text{s}$	microsecond
$X$	reactance	$\nu$	frequency; kinematic velocity; stoichiometric number
$x$	mole fraction	$\nu_e$	neutrino
XAFS	x-ray absorption fine structure	$\nu$	wavenumber
Xan	xanthine	$\pi$	pion
XANES	x-ray absorption near-edge structure	$\Pi$	osmotic pressure; Peltier coefficient
Xao	xanthosine	$\rho$	density; reflectance; resistivity
Xlu, Xul	xylulose	$\sigma$	electrical conductivity; cross section; normal stress; shielding constant (NMR); Stefan-Boltzmann constant; surface tension; standard deviation
XPS, XPES	x-ray photoelectron spectroscopy	$\tau$	transmittance; chemical shift; shear stress; relaxation time
XRD	x-ray diffraction	$\phi$	electrical potential; fugacity coefficient; osmotic coefficient; quantum yield; wavefunction
XRF	x-ray fluorescence	$\Phi$	magnetic flux; potential energy; radiant power; work function
XRS	x-ray spectroscopy	$\chi$	magnetic susceptibility
Xyl	xylose	$\chi_e$	electric susceptibility
Y	yotta (SI prefix for $10^{24}$ )	$\Psi$	wavefunction
$Y$	admittance; Planck function; Young's modulus	$\omega$	circular frequency; angular velocity; harmonic vibration wavenumber; statistical weight
$y$	yocto (SI prefix for $10^{-24}$ )	$\Omega$	ohm
$y$	mole fraction for gas (when $x$ refers to liquid phase)	$\Omega$	axial angular momentum; solid angle
$y, \text{yr}$	year		
yd	yard		
Z	zetta (SI prefix for $10^{21}$ )		
$Z$	atomic number; compression factor; collision number; impedance; partition function; zusammen ( <i>cis</i> -configuration)		
$z$	zepto (SI prefix for $10^{-21}$ )		
$z$	charge number (of an ion); collision frequency factor		
ZDO	zero differential overlap		
ZINDO	Zerner's INDO method		
ZPE, ZPVE	zero point vibrational energy		
ZULU	Greenwich mean time		
$\alpha$	alpha particle		
$\alpha$	absorption coefficient; degree of dissociation; electric polarizability; expansion coefficient; fine structure constant		