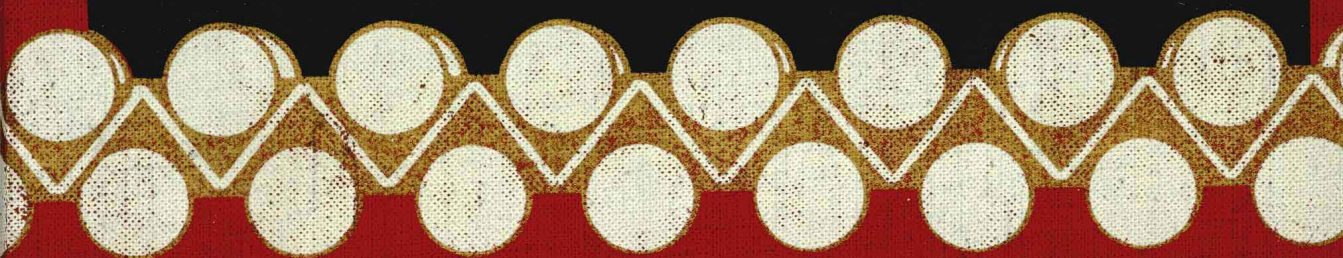


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**ENCYCLOPEDIA OF
POLYMER
SCIENCE
AND
ENGINEERING**



VOLUME 2

ENCYCLOPEDIA OF POLYMER SCIENCE AND ENGINEERING

VOLUME 2

**Anionic Polymerization
to
Cationic Polymerization**

A WILEY-INTERSCIENCE PUBLICATION

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CONVERSION FACTORS, ABBREVIATIONS, AND UNIT SYMBOLS

SI Units (Adopted 1960)

A new system of measurement, the International System of Units (abbreviated SI), is being implemented throughout the world. This system is a modernized version of the MKSA (meter, kilogram, second, ampere) system, and its details are published and controlled by an international treaty organization (The International Bureau of Weights and Measures) (1).

SI units are divided into three classes:

Base Units

length	meter [*] (m)
mass [‡]	kilogram (kg)
time	second (s)
electric current	ampere (A)
thermodynamic temperature [§]	kelvin (K)
amount of substance	mole (mol)
luminous intensity	candela (cd)

Supplementary Units

plane angle	radian (rad)
solid angle	steradian (sr)

^{*}The spellings "metre" and "litre" are preferred by ASTM; however, "-er" is used in the *Encyclopedia*.

[‡]"Weight" is the commonly used term for "mass."

[§]Wide use is made of "Celsius temperature" (t) defined by

$$t = T - T_0$$

where T is the thermodynamic temperature, expressed in kelvins, and $T_0 = 273.15 \text{ K}$ by definition. A temperature interval may be expressed in degrees Celsius as well as in kelvins.

Derived Units and Other Acceptable Units

These units are formed by combining base units, supplementary units, and other derived units (2–4). Those derived units having special names and symbols are marked with an asterisk in the list below:

<i>Quantity</i>	<i>Unit</i>	<i>Symbol</i>	<i>Acceptable equivalent</i>
*absorbed dose	gray	Gy	J/kg
acceleration	meter per second squared	m/s ²	
*activity (of ionizing radiation source)	becquerel	Bq	1/s
area	square kilometer	km ²	
	square hectometer	hm ²	ha (hectare)
	square meter	m ²	
*capacitance	farad	F	C/V
concentration (of amount of substance)	mole per cubic meter	mol/m ³	
*conductance	siemens	S	A/V
current density	ampere per square meter	A/m ²	
density, mass density	kilogram per cubic meter	kg/m ³	g/L; mg/cm ³
dipole moment (quantity)	coulomb meter	C·m	
*electric charge, quantity of electricity	coulomb	C	A·s
electric charge density	coulomb per cubic meter	C/m ³	
electric field strength	volt per meter	V/m	
electric flux density	coulomb per square meter	C/m ²	
*electric potential, potential difference, electromotive force	volt	V	W/A
*electric resistance	ohm	Ω	V/A
*energy, work, quantity of heat	megajoule	MJ	
	kilojoule	kJ	
	joule	J	
	electronvolt [†]	eV [†]	N·m
	kilowatt hour [†]	kW·h [†]	
energy density	joule per cubic meter	J/m ³	
*force	kilonewton	kN	
	newton	N	kg·m/s ²

[†]This non-SI unit is recognized by the CIPM as having to be retained because of practical importance or use in specialized fields (1).

<i>Quantity</i>	<i>Unit</i>	<i>Symbol</i>	<i>Acceptable equivalent</i>
*frequency	megahertz	MHz	
	hertz	Hz	1/s
heat capacity, entropy	joule per kelvin	J/K	
heat capacity (specific), specific entropy	joule per kilogram kelvin	J/(kg·K)	
heat transfer coefficient	watt per square meter kelvin	W/(m ² ·K)	
*illuminance	lux	lx	lm/m ²
*inductance	henry	H	Wb/A
linear density	kilogram per meter	kg/m	
luminance	candela per square meter	cd/m ²	
*luminous flux	lumen	lm	cd·sr
magnetic field strength	ampere per meter	A/m	
*magnetic flux	weber	Wb	V·s
*magnetic flux density	tesla	T	Wb/m ²
molar energy	joule per mole	J/mol	
molar entropy, molar heat capacity	joule per mole kelvin	J/(mol·K)	
moment of force, torque	newton meter	N·m	
momentum	kilogram meter per second	kg·m/s	
permeability	henry per meter	H/m	
permittivity	farad per meter	F/m	
*power, heat flow rate, radiant flux	kilowatt watt	kW W	J/s
power density, heat flux density, irradiance	watt per square meter	W/m ²	
*pressure, stress	megapascal kilopascal pascal	MPa kPa Pa	N/m ²
sound level	decibel	dB	
specific energy	joule per kilogram	J/kg	
specific volume	cubic meter per kilogram	m ³ /kg	
surface tension	newton per meter	N/m	
thermal conductivity	watt per meter kelvin	W/(m·K)	
velocity	meter per second kilometer per hour	m/s km/h	
viscosity, dynamic	pascal second millipascal second	Pa·s mPa·s	
viscosity, kinematic	square meter per second square millimeter per second	m ² /s mm ² /s	

<i>Quantity</i>	<i>Unit</i>	<i>Symbol</i>	<i>Acceptable equivalent</i>
volume	cubic meter	m ³	
	cubic decimeter	dm ³	L(liter) (5)
	cubic centimeter	cm ³	mL
wave number	1 per meter	m ⁻¹	
	1 per centimeter	cm ⁻¹	

In addition, there are 16 prefixes used to indicate order of magnitude, as follows:

Multiplication

<i>factor</i>	<i>Prefix</i>	<i>Symbol</i>	<i>Note</i>
10 ¹⁸	exa	E	^a Although hecto, deka, deci, and centi are SI prefixes, their use should be avoided except for SI unit-multiples for area and volume and nontechnical use of centimeter, as for body and clothing measurement.
10 ¹⁵	peta	P	
10 ¹²	tera	T	
10 ⁹	giga	G	
10 ⁶	mega	M	
10 ³	kilo	k	
10 ²	hecto	h ^a	
10	deka	da ^a	
10 ⁻¹	deci	d ^a	
10 ⁻²	centi	c ^a	
10 ⁻³	milli	m	
10 ⁻⁶	micro	μ	
10 ⁻⁹	nano	n	
10 ⁻¹²	pico	p	
10 ⁻¹⁵	femto	f	
10 ⁻¹⁸	atto	a	

For a complete description of SI and its use, the reader is referred to ASTM E 380 (4).

A representative list of conversion factors from non-SI to SI units is presented herewith. Factors are given to four significant figures. Exact relationships are followed by a dagger. A more complete list is given in ASTM E 380-84(4) and ANSI Z210.1-1976 (6).

Conversion Factors to SI Units

<i>To convert from</i>	<i>To</i>	<i>Multiply by</i>
acre	square meter (m ²)	4.047 × 10 ³
angstrom	meter (m)	1.0 × 10 ^{-10†}
are	square meter (m ²)	1.0 × 10 ^{2†}
astronomical unit	meter (m)	1.496 × 10 ¹¹
atmosphere	pascal (Pa)	1.013 × 10 ⁵
bar	pascal (Pa)	1.0 × 10 ^{5†}
barn	square meter (m ²)	1.0 × 10 ^{-28†}

[†]Exact.

<i>To convert from</i>	<i>To</i>	<i>Multiply by</i>
barrel (42 U.S. liquid gallons)	cubic meter (m ³)	0.1590
Bohr magneton (μ_B)	J/T	9.274×10^{-24}
Btu (International Table)	joule (J)	1.055×10^3
Btu (mean)	joule (J)	1.056×10^3
Btu (thermochemical)	joule (J)	1.054×10^3
bushel	cubic meter (m ³)	3.524×10^{-2}
calorie (International Table)	joule (J)	4.187
calorie (mean)	joule (J)	4.1908
calorie (thermochemical)	joule (J)	4.184 [†]
centipoise	pascal second (Pa·s)	1.0×10^{-3} [†]
centistokes	square millimeter per second (mm ² /s)	1.0 [†]
cfm (cubic foot per minute)	cubic meter per second (m ³ /s)	4.72×10^{-4}
cubic inch	cubic meter (m ³)	1.639×10^{-5}
cubic foot	cubic meter (m ³)	2.832×10^{-2}
cubic yard	cubic meter (m ³)	0.7646
curie	becquerel (Bq)	3.70×10^{10} [†]
debye	coulomb·meter (C·m)	3.336×10^{-30}
degree (angle)	radian (rad)	1.745×10^{-2}
denier (international)	kilogram per meter (kg/m)	1.111×10^{-7}
dram (apothecaries')	tex [‡]	0.1111
dram (avoirdupois)	kilogram (kg)	3.888×10^{-3}
dram (U.S. fluid)	kilogram (kg)	1.772×10^{-3}
dyne	cubic meter (m ³)	3.697×10^{-6}
dyne/cm	newton (N)	1.0×10^{-5} [†]
electron volt	newton per meter (N/m)	1.0×10^{-3} [†]
erg	joule (J)	1.602×10^{-19}
fathom	joule (J)	1.0×10^{-7} [†]
fluid ounce (U.S.)	meter (m)	1.829
foot	cubic meter (m ³)	2.957×10^{-5}
footcandle	meter (m)	0.3048 [†]
furlong	lux (lx)	10.76
gal	meter (m)	2.012×10^{-2}
gallon (U.S. dry)	meter per second squared (m/s ²)	1.0×10^{-2} [†]
gallon (U.S. liquid)	cubic meter (m ³)	4.405×10^{-3}
gallon per minute (gpm)	cubic meter (m ³)	3.785×10^{-3}
gauss	cubic meter per second (m ³ /s)	6.308×10^{-5}
gilbert	cubic meter per hour (m ³ /h)	0.2271
gill (U.S.)	tesla (T)	1.0×10^{-4}
grad	ampere (A)	0.7958
grain	cubic meter (m ³)	1.183×10^{-4}
	radian	1.571×10^{-2}
	kilogram (kg)	6.480×10^{-5}

[†]Exact.[‡]See footnote on p. x.

<i>To convert from</i>	<i>To</i>	<i>Multiply by</i>
gram-force per denier	newton per tex (N/tex)	8.826×10^{-2}
hectare	square meter (m ²)	$1.0 \times 10^{4\dagger}$
horsepower (550 ft·lbf/s)	watt (W)	7.457×10^2
horsepower (boiler)	watt (W)	9.810×10^3
horsepower (electric)	watt (W)	$7.46 \times 10^{2\dagger}$
hundredweight (long)	kilogram (kg)	50.80
hundredweight (short)	kilogram (kg)	45.36
inch	meter (m)	$2.54 \times 10^{-2\dagger}$
inch of mercury (32°F)	pascal (Pa)	3.386×10^3
inch of water (39.2°F)	pascal (Pa)	2.491×10^2
kilogram-force	newton (N)	9.807
kilowatt hour	megajoule (MJ)	$3.6^\dagger$
kip	newton (N)	4.48×10^3
knot (international)	meter per second (m/s)	0.5144
lambert	candela per square meter (cd/m ²)	3.183×10^3
league (British nautical)	meter (m)	5.559×10^3
league (statute)	meter (m)	4.828×10^3
light year	meter (m)	9.461×10^{15}
liter (for fluids only)	cubic meter (m ³)	$1.0 \times 10^{-3\dagger}$
maxwell	weber (Wb)	$1.0 \times 10^{-8\dagger}$
micron	meter (m)	$1.0 \times 10^{-6\dagger}$
mil	meter (m)	$2.54 \times 10^{-5\dagger}$
mile (statute)	meter (m)	1.609×10^3
mile (U.S. nautical)	meter (m)	$1.852 \times 10^{3\dagger}$
mile per hour	meter per second (m/s)	0.4470
millibar	pascal (Pa)	1.0×10^2
millimeter of mercury (0°C)	pascal (Pa)	$1.333 \times 10^{2\dagger}$
minute (angular)	radian	2.909×10^{-4}
myriagram	kilogram (kg)	10
myriameter	kilometer (km)	10
oersted	ampere per meter (A/m)	79.58
ounce (avoirdupois)	kilogram (kg)	2.835×10^{-2}
ounce (troy)	kilogram (kg)	3.110×10^{-2}
ounce (U.S. fluid)	cubic meter (m ³)	2.957×10^5
ounce-force	newton (N)	0.2780
peck (U.S.)	cubic meter (m ³)	8.810×10^{-3}
pennyweight	kilogram (kg)	1.555×10^{-3}
pint (U.S. dry)	cubic meter (m ³)	5.506×10^{-4}
pint (U.S. liquid)	cubic meter (m ³)	4.732×10^{-4}
poise (absolute viscosity)	pascal second (Pa·s)	$0.10^\dagger$
pound (avoirdupois)	kilogram (kg)	0.4536
pound (troy)	kilogram (kg)	0.3732
poundal	newton (N)	0.1383
pound-force	newton (N)	4.448

†Exact.

<i>To convert from</i>	<i>To</i>	<i>Multiply by</i>
pound-force per square inch (psi)	pascal (Pa)	6.895×10^3
quart (U.S. dry)	cubic meter (m ³)	1.101×10^{-3}
quart (U.S. liquid)	cubic meter (m ³)	9.464×10^{-4}
quintal	kilogram (kg)	$1.0 \times 10^{2\dagger}$
rad	gray (Gy)	$1.0 \times 10^{-2\dagger}$
rod	meter (m)	5.029
roentgen	coulomb per kilogram (C/kg)	2.58×10^{-4}
second (angle)	radian (rad)	4.848×10^{-6}
section	square meter (m ²)	2.590×10^6
slug	kilogram (kg)	14.59
spherical candle power	lumen (lm)	12.57
square inch	square meter (m ²)	6.452×10^{-4}
square foot	square meter (m ²)	9.290×10^{-2}
square mile	square meter (m ²)	2.590×10^6
square yard	square meter (m ²)	0.8361
stere	cubic meter (m ³)	$1.0^\dagger$
stokes (kinematic viscosity)	square meter per second (m ² /s)	$1.0 \times 10^{-4\dagger}$
tex	kilogram per meter (kg/m)	$1.0 \times 10^{-6\dagger}$
ton (long, 2240 pounds)	kilogram (kg)	1.016×10^3
ton (metric)	kilogram (kg)	$1.0 \times 10^{3\dagger}$
ton (short, 2000 pounds)	kilogram (kg)	9.072×10^2
torr	pascal (Pa)	1.333×10^2
unit pole	weber (Wb)	1.257×10^{-7}
yard	meter (m)	$0.9144^\dagger$

Abbreviations and Unit Symbols

Following is a list of commonly used abbreviations and unit symbols appropriate for use in the *Encyclopedia*. In general they agree with those listed in *American National Standard Abbreviations for Use on Drawings and in Text (ANSI Y1.1)* (6) and *American National Standard Letter Symbols for Units in Science and Technology (ANSI Y10)* (6). Also included is a list of acronyms for a number of private and government organizations as well as common industrial solvents, polymers, and other chemicals.

Rules for Writing Unit Symbols (4):

1. Unit symbols should be printed in upright letters (roman) regardless of the type style used in the surrounding text.
2. Unit symbols are unaltered in the plural.
3. Unit symbols are not followed by a period except when used as the end of a sentence.
4. Letter unit symbols are generally written in lowercase (eg, cd for candela) unless the unit name has been derived from a proper name, in which case the first letter of the symbol is capitalized (W, Pa). Prefix and unit symbols retain their prescribed form regardless of the surrounding typography.

[†]Exact.

5. In the complete expression for a quantity, a space should be left between the numerical value and the unit symbol. For example, write 2.37 lm, *not* 2.37lm, and 35 mm, *not* 35mm. When the quantity is used in an adjectival sense, a hyphen is often used, for example, 35-mm film. *Exception:* No space is left between the numerical value and the symbols for degree, minute, and second of plane angle, and degree Celsius.

6. No space is used between the prefix and unit symbols (eg, kg).

7. Symbols, not abbreviations, should be used for units. For example, use "A," not "amp," for ampere.

8. When multiplying unit symbols, use a raised dot:

N·m for newton meter

In the case of W·h, the dot may be omitted, thus:

Wh

An exception to this practice is made for computer printouts, automatic typewriter work, etc, where the raised dot is not possible, and a dot on the line may be used.

9. When dividing unit symbols use one of the following forms:

$$\text{m/s or m}\cdot\text{s}^{-1} \text{ or } \frac{\text{m}}{\text{s}}$$

In no case should more than one slash be used in the same expression unless parentheses are inserted to avoid ambiguity. For example, write:

J/(mol·K) or J·mol⁻¹ · K⁻¹ or (J/mol)/K

but *not*

J/mol/K

10. Do not mix symbols and unit names in the same expression. Write:

joules per kilogram or J/kg or J·kg⁻¹

but *not*

joules/kilogram *nor* joules/kg *nor* joules·kg⁻¹

Abbreviations and Units

A	ampere	ac-	alicyclic
A	anion (eg, HA); mass number	ACGIH	American Conference of Governmental Industrial Hygienists
a	atto (prefix for 10 ⁻¹⁸)	ACS	American Chemical Society
AATCC	American Association of Textile Chemists and Colorists	AGA	American Gas Association
ABS	acrylonitrile-butadiene-styrene	Ah	ampere hour
abs	absolute	AICHE	American Institute of Chemical Engineers
ac	alternating current, <i>n.</i>	AIME	American Institute of Mining, Metallurgical, and Petroleum Engineers
a-c	alternating current, <i>adj.</i>		

AIP	American Institute of Physics	bid	twice daily
AISI	American Iron and Steel Institute	Boc	<i>t</i> -butyloxycarbonyl
alc	alcohol(ic)	BOD	biochemical (biological) oxygen demand
Alk	alkyl	bp	boiling point
alk	alkaline (not alkali)	Bq	becquerel
-alt-	alternating as in alternating copolymer	C	coulomb
amt	amount	°C	degree Celsius
amu	atomic mass unit	C-	denoting attachment to carbon
ANSI	American National Standards Institute	C_M	chain-transfer constant for monomer
AO	atomic orbital	C_P	chain-transfer constant for polymer
AOAC	Association of Official Analytical Chemists	C_S	chain-transfer constant for solvent
AOCS	American Oil Chemists' Society	c	centi (prefix for 10^{-2})
APHA	American Public Health Association	<i>c</i>	critical
API	American Petroleum Institute	ca	circa (approximately)
aq	aqueous	cd	candela; current density; circular dichroism
Ar	aryl	CFR	Code of Federal Regulations
ar-	aromatic	cgs	centimeter-gram-second
as-	asymmetric(al)	CI	Color Index
ASH-RAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers	<i>cis</i> -	isomer in which substituted groups are on same side of double bond between C atoms
ASM	American Society for Metals	cl	carload
ASME	American Society of Mechanical Engineers	cm	centimeter
ASTM	American Society for Testing and Materials	cmil	circular mil
at no.	atomic number	cmpd	compound
at wt	atomic weight	CNRS	Centre National de la Recherche Scientifique
av(g)	average	CNS	central nervous system
AWS	American Welding Society	-co-	copolymerized with
^b	bonding orbital	CoA	coenzyme A
bbl	barrel	CoC	Cleveland open cup
bcc	body-centered cubic	COD	chemical oxygen demand
bct	body-centered tetragonal	coml	commercial(ly)
Bé	Baumé	conc	concentration
BET	Brunauer-Emmett-Teller (adsorption equation)	cp	chemically pure
		cph	close-packed hexagonal
		CPSC	Consumer Product Safety Commission
		cryst	crystalline

cub	cubic	EPA	Environmental Protection Agency
D	Debye		
D-	denoting configurational relationship	epr	electron paramagnetic resonance
d	differential operator	ϵ	dielectric constant (unitless)
d-	<i>dextro</i> -, dextrorotatory	eq.	equation
da	deka (prefix for 10^1)	esca	electron-spectroscopy for chemical analysis
dB	decibel		
dc	direct current, <i>n.</i>	esp	especially
d-c	direct current, <i>adj.</i>	esr	electron-spin resonance
dec	decompose	est(d)	estimate(d)
detd	determined	estn	estimation
detn	determination	esu	electrostatic unit
dia	diameter	η	viscosity
dil	dilute	$[\eta]$	intrinsic viscosity
dl-; DL-	racemic	η_{inh}	inherent viscosity
DMA	dimethylacetamide	η_r	relative viscosity
DMF	dimethylformamide	η_{red}	reduced viscosity
DMG	dimethyl glyoxime	η_{sp}	specific viscosity
DMSO	dimethyl sulfoxide	exp	experiment, experimental
DOD	Department of Defense	ext(d)	extract(ed)
DOE	Department of Energy	F	farad (capacitance)
DOT	Department of Transportation	<i>F</i>	faraday (96,487 C); free energy
DP	degree of polymerization	f	femto (prefix for 10^{-15})
dp	dew point	FAO	Food and Agriculture Organization (United Nations)
DPH	diamond pyramid hardness		
DS	degree of substitution	fcc	face-centered cubic
dsc	differential scanning calorimetry	FDA	Food and Drug Administration
dstl(d)	distill(ed)	FEA	Federal Energy Administration
dta	differential thermal analysis	FHSA	Federal Hazardous Substances Act
<i>E</i>	Young's modulus	fob	free on board
(<i>E</i>)-	entgegen; opposed	fp	freezing point
<i>e</i>	polarity factor in Alfrey-Price equation	FPC	Federal Power Commission
e^-	electron	FRB	Federal Reserve Board
ECU	electrochemical unit	frz	freezing
ed.	edited, edition, editor	G	giga (prefix for 10^9)
ED	effective dose	<i>G</i>	gravitational constant = $6.67 \times 10^{11} \text{ N}\cdot\text{m}^2/\text{kg}^2$;
EDTA	ethylenediaminetetraacetic acid		Gibb's free energy
emf	electromotive force	g	gram
emu	electromagnetic unit	(g)	gas, only as in $\text{H}_2\text{O(g)}$
en	ethylene diamine	<i>g</i>	gravitational acceleration
eng	engineering		

-g-	graft as in graft copolymer	IRLG	Interagency Regulatory Liaison Group
gc	gas chromatography	ISO	International Organization for Standardization
gem-	geminal	IU	International Unit
glc	gas-liquid chromatography	IUPAC	International Union of Pure and Applied Chemistry
g-mol	gram-molecular weight	IV	iodine value
wt;		iv	intravenous
gmw		J	joule
GNP	gross national product	K	kelvin
gpc	gel-permeation chromatography	<i>K</i>	equilibrium constant
GRAS	Generally Recognized as Safe	k	kilo (prefix for 10 ³)
grd	ground	<i>k</i>	reaction rate constant
Gy	gray	kg	kilogram
H	henry	L	denoting configurational relationship
<i>H</i>	enthalpy	L	liter (for fluids only) (5)
h	hour; hecto (prefix for 10 ²)	<i>l</i> -	<i>levo</i> -, levorotatory
ha	hectare	(l)	liquid, only as in NH ₃ (l)
HB	Brinell hardness number	LC ₅₀	conc lethal to 50% of the animals tested
Hb	hemoglobin	LCAO	linear combination of atomic orbitals
hcp	hexagonal close-packed	LCD	liquid crystal display
hex	hexagonal	lcl	less than carload lots
HK	Knoop hardness number	LD ₅₀	dose lethal to 50% of the animals tested
hplc	high-pressure liquid chromatography	LED	light-emitting diode
HRC	Rockwell hardness (C scale)	liq	liquid
HV	Vickers hardness number	lm	lumen
hyd	hydrated, hydrous	ln	logarithm (natural)
hyg	hygroscopic	LNG	liquefied natural gas
Hz	hertz	log	logarithm (common)
ⁱ (eg, Pr ⁱ)	iso (eg, isopropyl)	LPG	liquefied petroleum gas
<i>i</i> -	inactive (eg, <i>i</i> -methionine)	ltl	less than truckload lots
IACS	International Annealed Copper Standard	lx	lux
ibp	initial boiling point	M	mega (prefix for 10 ⁶); metal (as in MA)
IC	inhibitory concentration	<i>M</i>	molar; actual mass
ICC	Interstate Commerce Commission	$\bar{M}_w$	weight-average mol wt
ICT	International Critical Table	$\bar{M}_n$	number-average mol wt
ID	inside diameter; infective dose	$\bar{M}_v$	viscosity-average mol wt
ip	intraperitoneal	m	meter; milli (prefix for 10 ⁻³)
IPS	iron pipe size	<i>m</i>	molal
IPTS	International Practical Temperature Scale (NBS)	<i>m</i> -	meta
ir	infrared		

max	maximum	NEMA	National
MCA	Chemical Manufacturers' Association (was Manufacturing Chemists Association)	NF	Electrical Manufacturer's Association
		NIH	<i>National Formulary</i>
MEK	methyl ethyl ketone		National Institutes of Health
meq	milliequivalent	NIOSH	National Institute of Occupational Safety and Health
mfd	manufactured		
mfg	manufacturing	nmr	nuclear magnetic resonance
mfr	manufacturer	NND	New and Nonofficial Drugs (AMA)
MIBC	methyl isobutyl carbinol	no.	number
MIBK	methyl isobutyl ketone	NOI(BN)	not otherwise indexed (by name)
MIC	minimum inhibiting concentration	NOS	not otherwise specified
min	minute; minimum	nqr	nuclear quadrupole resonance
mL	milliliter	NRC	Nuclear Regulatory Commission; National Research Council
MLD	minimum lethal dose	NRI	New Ring Index
MO	molecular orbital	NSF	National Science Foundation
mo	month	NTA	nitrilotriacetic acid
mol	mole	NTP	normal temperature and pressure (25°C and 101.3 kPa or 1 atm)
mol wt	molecular weight	NTSB	National Transportation Safety Board
mp	melting point	O-	denoting attachment to oxygen
MR	molar refraction	o-	ortho
ms	mass spectrum	OD	outside diameter
mxt	mixture	ω	frequency
μ	micro (prefix for 10^{-6})	OPEC	Organization of Petroleum Exporting Countries
N	newton (force)	OSHA	Occupational Safety and Health Administration
<i>N</i>	normal (concentration); neutron number	owf	on weight of fiber
<i>N</i> -	denoting attachment to nitrogen	Ω	ohm
<i>n</i> (as n_D^{20})	index of refraction (for 20°C and sodium light)	P	peta (prefix for 10^{15})
ⁿ (as Bu ⁿ), <i>n</i> -	normal (straight-chain structure)	p	pico (prefix for 10^{-12})
<i>n</i>	neutron	<i>p</i> -	para
<i>n</i>	nano (prefix for 10^9)	<i>p</i>	proton
na	not available	<i>p</i> .	page
NAS	National Academy of Sciences	Pa	pascal (pressure)
NASA	National Aeronautics and Space Administration		
nat	natural		
NBS	National Bureau of Standards		
neg	negative		