





# Practical Methods for Biocatalysis and Biotransformations 2



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Edited by

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# Abbreviations

AADH	Alanine dehydrogenase
AAO	Amino acid oxidase
ACN	Acetonitrile
AcOH	Acetic acid
Ac <sub>2</sub> O	Acetic anhydride
ACS GCIPR	American Chemical Society Green Chemistry Institute Pharmaceutical Roundtable
ADH	Alcohol dehydrogenase (alternative name for a ketoreductase, KRED; carbonyl reductase, CRED)
ADP	Adenosine diphosphate
ALK	Anaplastic lymphoma kinase
AMDase	Aryl malonate decarboxylase
6-APA	6-Aminopenicillanic acid
API	Active pharmaceutical ingredient
Aq	Aqueous
AR	Aldose reductase
ARI	Aldehyde reductase I
AT	Aminotransferase
ATP	Adenosine-5'-triphosphate
BAL	Benzaldehyde lyase
BCA	Bicinchoninic acid
BcAT	Branched-chain aminotransferase
Boc	<i>t</i> -Butoxycarbonyl
BOV	Base outlet valve
BREP	Butanol rinsed enzyme preparation
BVMO	Baeyer–Villiger monooxygenase
CAL-B	Lipase B from <i>Candida Antarctica</i>
cDNA	Complimentary deoxyribonucleic acid
CDW	Cell dry weight
CLEA	Cross-linked enzyme aggregate
CLEC	Cross-linked enzyme crystal
c-Met	Mesenchymal-epithelial transition
CMO	Contract manufacturing organization
CoA	Coenzyme A
CoE	Center of excellence
COPD	Chronic obstructive pulmonary disease
CRED	Carbonyl reductase (alternative name for an alcohol dehydrogenase, ADH; ketoreductase, KRED)

CRO	Contract research organization
CSL	Corn Steep Liquor
CYP	Cytochrome P450
CYP450	Cytochrome P450
DABCO	1,4-Diazabicyclo[2.2.2]octane
DAD	Diode-array detector
DBU	1,8-Diazabicyclo[5.4.0]undec-7-ene
DCHA	Dicyclohexylamine
DCM	Dichloromethane
Dcw	Dry cell weight
DEAE	Diethylaminoethyl (group in ion exchange resin)
D-GAP	D-Glyceraldehyde 3-phosphate
DHA	Dihydroxyacetone
DHAK	Dihydroxyacetone kinase
DHAP	Dihydroxyacetone phosphate
DIP-Cl	(-)-B-Chlorodiisopinocampheylborane
DIPE	Diisopropylether
DIPEA	Di-isopropyl ethylamine
DkgA	2,4-Diketo gluconic acid
DKR	Dynamic kinetic resolution
DMAP	4-Dimethylaminopyridine
DMAPP	Dimethylallyl diphosphate
DME	1,2-Dimethoxyethane
DMF	Dimethylformamide
DMPK	Drug metabolism/pharmacokinetics
DMSO	Dimethyl sulfoxide
DNA	Deoxyribonucleic acid
dNTPs	Deoxynucleoside triphosphates
DO	Dissolved oxygen
DOT	Dissolved oxygen tension
DSC	Differential scanning calorimetry
DXR	1-Deoxy-D-xylulose 5-phosphate reductoisomerase
DXP	1-Deoxy-D-xylulose 5-phosphate
DXS	1-Deoxy-D-xylulose-5-phosphate synthase
E	Enantiomeric ratio
ED	Electrodialysis
EDTA	Ethylenediaminetetraacetic acid
EIH	Entry into human
Ep-PCR	Error-prone polymerase chain reaction
EPRP	Enzyme precipitated and rinsed with propanol
Et <sub>3</sub> N	Triethylamine
EtOAc	Ethyl acetate
EtOH	Ethanol
FAD	Flavin adenine dinucleotide
FADH <sub>2</sub>	Flavin adenine dinucleotide, reduced form
FDH	Formate dehydrogenase

FID	Flame ionization detection
FPP	Farnesyl pyrophosphate
FTIR	Fourier-transform infrared spectroscopy
FTO	Freedom to operate
G1P	Glucose-1-phosphate
G6P	Glucose-6-phosphate
G6PDH	Glucose-6-phosphate dehydrogenase
GABA	$\gamma$ -Aminobutyric acid
GAD	Glutamic acid $\alpha$ -decarboxylase
GC	Gas chromatography
GC-FID	Gas chromatography–flame ionization detection
GDH	Glucose dehydrogenase
GDH	Glycerophosphate dehydrogenase
GITC	2,3,4,6-Tetra-O-acetyl-D-glucopyranosyl isothiocyanate
GlcI	Glucose isomerase
Glu	L-Glutamate
GluDH	Gluconate-5-dehydrogenase
GNO	Gluconate-5-dehydrogenase
GOase	Galactose oxidase
GRAS	Generally regarded as safe
GSK	GlaxoSmithKline
HAG	Hydroxyadamantylglycine
HAOE	2-(3-Hydroxy-1-adamantyl)-2-oxoethanoic acid
HAPMO	4-Hydroxyacetophenone monooxygenase
HEPES	4-(2-Hydroxyethyl)-1-piperazineethanesulfonic acid
15(S)-HETE	(5Z,8Z,11Z,13E)(15S)-15-hydroxyeicosa-5,8,11,13-tetraenoic acid (Icomucret)
H <sub>2</sub> O <sub>2</sub>	Hydrogen peroxide
HPLC	High performance liquid chromatography
HPLC-DAD	High performance liquid chromatography with diode array detection
HRP	Horse radish peroxidase
HTP	High throughput
HTS	High throughput screening
I3G	Isorhamnetin 3-O-glucoside
iGEM	International genetically engineered machine
IPA	Isopropyl alcohol
IPAc	Isopropyl acetate
IP	Intellectual property
<i>i</i> -PrNH <sub>2</sub>	Isopropylamine
IPTG	Isopropyl- $\beta$ -D-thiogalactopyranoside
ISPR	<i>In situ</i> product removal
Kbp	Kilobase pair
KPB	Potassium phosphate buffer
KGA	Keto-gluconic acid
KRED	Ketoreductase (alternative name for an alcohol dehydrogenase, ADH; carbonyl reductase, CRED)

LB	Luria–Bertani
LB-ADH	<i>Lactobacillus brevis</i> ADH
LC	Liquid chromatography
LCA	Life cycle analysis
LC-MS	Liquid chromatography–mass spectrometry
LDH	Lactose dehydrogenase
MAO-N	Monoamine oxidase
MeTHF	2-Methyltetrahydrofuran
MEP	2-Methyl-D-erythritol 4-phosphate
MTP	Microtiter plate
MeOH	Methanol
mGluR5	Metabotropic glutamate receptor subtype 5
MMP	Matrix metalloproteinases
MPB	Mobile phase B
Mpt	Melting point
MPLC	Medium pressure liquid chromatography
mRNA	Messenger ribonucleic acid
MTases	Methyl transferases
MTBE	<i>tert</i> -Butylmethylether
MYB	Malt yeast broth
NaBH <sub>4</sub>	Sodium borohydride
NAD <sup>+</sup>	β-Nicotinamide adenine dinucleotide
NADH	β-Nicotinamide adenine dinucleotide, reduced form
NADPH	β-Nicotinamide adenine dinucleotide 2'-phosphate, reduced form
NAD(P)H	β-Nicotinamide adenine dinucleotide, reduced form or β-nicotinamide adenine dinucleotide 2'-phosphate, reduced form
NADP <sup>+</sup>	β-Nicotinamide adenine dinucleotide 2'-phosphate
NAG-6P	N-Acetyl-D-glucosamine-6-phosphate
NCE	New chemical entity
NCS	( <i>S</i> )-Norcochlorine synthase
Nf-kB	Nuclear factor–kappaB
NH <sub>3</sub>	Ammonia
Ni-NTA	Nickel-nitrilotriacetic acid
NMR	Nuclear magnetic resonance spectroscopy
NSCLC	Non-small cell lung carcinoma
NYA	Nutritive yeast agar
Oct <sub>3</sub> N	Trioctylamine
OD	Optical density
OPR	Oxophytodienoate reductase
ORF	Open reading frame
OYE	Old yellow enzyme
PIII	Phase III
P450	Cytochrome P450
P450 BM-3	Cytochrome P450 BM-3 from <i>Bacillus megaterium</i>
PA	Phosphate aldolase
PAL	Phenylalanine ammonia lyase

PAM	Phenylalanine aminomutase
PAMO	Phenylacetone monooxygenase
PAPS	3'-Phosphoadenosine-5'-phosphosulfate
PCR	Polymerase chain reaction
PDA	Potato dextrose agar
PDB	Potato dextrose broth
PDC	Pyruvate decarboxylase
PCR	Polymerase chain reaction
PDCB	Potato/dextrose/carrot broth
PGA	Penicillin G acylase
PGR	Pyrogallol red
PGT	Phenol glucose transferase
PhMe	Toluene
PhoN	Phosphatase (acid nucleoside)
PMI	Process mass intensity
PMSF	Phenylmethylsulfonyl fluoride
PLP	Pyridoxal 5'-phosphate
PP	Pyrophosphate
PPAR	Peroxisome proliferator-activated receptors
PPG	Polypropylene glycol (anti-foam)
PSE	Phosphate/sucrose/EDTA
psi	Pounds per square inch
PT	Prenyl transferase
PTFE	Poly(tetrafluoroethylene)
QbD	Quality by design
OctNH <sub>2</sub>	Octylamine
Qox	Quinaldine 4-oxidase
RAMA	Rabbit muscle aldolase (fructose-1,6-bis-phosphate aldolase)
R&D	Research and development
RhaD	Rhamnulose-1-phosphate aldolase
R2MP	( <i>R</i> )-2-Methylpentanol
RNA	Ribonucleic acid
ROH	Generic alcohol
ROMT	Rice O-methyl transferase
RP	Reversed phase
rpm	Rotations per minute
rt	Room temperature
$R_t$	Retention time
SAH	S-Adenosyl-DL-homocysteine
SAM	S-Adenosyl-DL-methionine
scCO <sub>2</sub>	Supercritical carbon dioxide
SCS	Sole carbon source
SDS	Sodium dodecyl sulfate
SFC	Supercritical fluid chromatography
SMB	Simulated moving bed chromatography
sMPP	Saturated mutation primer PCR

**xxviii** *Abbreviations*

SP	Sucrose phosphorylase
TA	Transaminase
t-BuNH <sub>2</sub>	<i>tertiary</i> -Butylamine
t-BuOH	<i>tertiary</i> -Butanol
Td	Doubling time (converse of more familiar half life)
ThDP	Thiamine pyrophosphate
TE	Tris-EDTA
TFA	Trifluoroacetic acid
THF	Tetrahydrofuran
TIC	Total ion current
TIM	Triose phosphate isomerase
TLC	Thin layer chromatography
TMEDA	Tetramethyl ethylenediamine
TMG	1,1,3,3-tetramethylguanidine
TPL	Tyrosine phenol lyase
Tris	Tris(hydroxymethyl)aminomethane
TSA	Trypticase soy agar
TSB	Trypticase soy broth
TSE	Transmissible spongiform encephalopathy
TTN	Total turnover number
UDP-Glc	Uridine diphosphate glucose
UGT	Uridinediphosphate-glucuronosyltransferase
UPLC	Ultra performance liquid chromatography
UV	Ultra violet
VVM	Gas volume flow per unit of liquid volume per minute (vessel volume per minute)
WT	Wild type
YMB	Yeast malt broth
YPG	Yeast extract/peptone/glucose
YT	Yeast tryptone