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List of Abbreviations

Å	Angstrom
eV	Electron volt
FT-IR	Fourier transform infrared
GC-MS	Gas chromatography-mass spectrometry
NMR	Nuclear magnetic resonance
IEA	International Energy Agency
JCPDS	Joint Committee on Powder Diffraction Standards
Gly	Glycerol
Ace	Acetone
E-factor	Environmental factor
PMI	Process Mass Index
CE	Carbon Efficiency
TOF	Turnover Frequency
AE	Atom Economy
M	Molar
EIA	Energy Information Administration
FAME	Fatty acid methyl ester
FFA	Free fatty acid
Kg	Kilogram
KJ/mol	Kilojoule per mole
kV	Kilovolt
nm	Nanometre
mmol/g	Millimole per gram
N	Stoichiometric factor
T	Temperature
°C	Degree Celsius
K	Kelvin
λ	Lambda
mM	Micrometre
pH	Potential of hydrogen
XRD	X-ray diffraction
TGA	Thermogravimetric analysis
SEM	Scanning electron microscopy
EDX	Energy dispersive X-ray analysis
XPS	X-ray photo electron spectroscopy
BET	Brunauer-Emmett-Teller
BJH	Barrett-Joyner-Halenda
pKa	Dissociation constant of acid
nm	Nanometer
rpm	Revolution per minute

wt. %	Weight percentage
θ	Theta
ZA	ZrO ₂ -Al ₂ O ₃
SZA	SO ₄ ⁻² /ZrO ₂ -Al ₂ O ₃
SC	SO ₄ ⁻² /CoAl ₂ O ₄ (1:0)
ST	SO ₄ ⁻² /TiO ₂ (0:2)
SCAT (3:2)	SO ₄ ⁻² /CoAl ₂ O ₄ -TiO ₂ (3:2)
SCAT (2:3)	SO ₄ ⁻² /CoAl ₂ O ₄ -TiO ₂ (2:3)
SCAT (4:1)	SO ₄ ⁻² /CoAl ₂ O ₄ -TiO ₂ (4:1)
SCAT (1:4)	SO ₄ ⁻² /CoAl ₂ O ₄ -TiO ₂ (1:4)
SZZ	SO ₄ ⁻² /ZnAl ₂ O ₄ -ZrO ₂
SZT	SO ₄ ⁻² /ZnAl ₂ O ₄ -TiO ₂