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Development of nanoparticle catalysts and total internal reflection (TIR) Raman spectroscopy for improved understanding of heterogeneous catalysis

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Abbreviations

Nanoparticles

For all nanoparticle systems the following abbreviations were used;

monometallic	metal/capping agent np
bimetallic	metal/metal/capping agent np
dual capping agent	metal/capping agent/capping agent np

np	nanoparticle
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All abbreviations

AC-TEM	aberration corrected- transmission electron microscopy
ATR-IR	attenuated total reflectance infrared
BET	Brunauer–Emmett–Teller
BF	bright field contrast
BJH	Barrett-Joyner-Halenda
CCD	charge-coupled device camera
CI	chemical ionisation
CW	continuous wave laser
DCB	dichlorobenzene
DFT	density functional theory
DRIFTS	diffuse reflectance infrared Fourier transform spectroscopy
DSC	differential scanning calorimetry
ECN	effective carbon number
EDX	Energy Dispersive X-ray spectroscopy
EELS	electron energy loss spectroscopy
EI	electron ionisation
EXAFS	extended X-ray absorption fine structure spectroscopy
FTIR	fourier-transform infrared spectroscopy
GC	gas chromatography
GCMS	gas chromatography–mass spectrometry
GPC	gel permeation chromatography
GR	galvanic replacement

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HAADF-STEM	high-angle annular dark-field scanning transmission electron microscopy
HPLC	high-performance liquid chromatography
HREM	high resolution electron microscopy
HR-TEM	high resolution-transmission electron microscopy
HSA	hemispherical analyser
ICP-OES	inductively coupled plasma-optical emission spectrometry
IR	infrared spectroscopy
KIT-6	mesoporous silica support (cubic pore structure)
LB	Langmuir Blodgett
LEED	low-energy electron diffraction
LEIS	low-energy ion scattering
LSPR	localised surface Plasmon resonances
LT-STM	low-temperature scanning tunnelling microscopy
MCT	mercury cadmium telluride detector
NAP-XPS	near ambient pressure X-ray photoelectron spectroscopy
NEXAFS	near edge X-ray absorption fine structure
NMR	nuclear magnetic resonance spectroscopy
OAc	oleic acid
OAm	oleylamine
ODA	octadecylamine
OME	oxametallacycle (bound to one silver with a 4 membered ring)
OMME	oxametallacycle (bound to two silver with a 5 membered ring)
P123	pluronic 123
PDI	polydispersity index
PNN	2-(di-tert-butylphosphinomethyl)-6-(diethylaminomethyl)pyridine type ligand
PVP	polyvinylpyrrolidone
PXRD	powder X-ray diffraction
RALS	right angle light scattering detection
RDS	rate determining step
RI	refractive index detection

SAA	single atom alloy
SBA-15	mesoporous silica support (hexagonal pore structure)
SCE	saturated calomel electrode
SEM	scanning electron microscopy
SERS	surface enhanced Raman scattering
SFG	sum frequency generation
SMAD	solvated metal atom dispersion
STM	scanning tunnelling microscopy
TCD	thermal conductivity detector
TEM	transmission electron microscopy
TEOS	tetraethyl orthosilicate
TEY	total electron yield
TGA	thermogravimetric analysis
TIR Raman	total internal reflection Raman spectroscopy
TOF	turnover frequency
TON	turnover number
TPD	temperature programmed desorption
UHP	ultra-high purity water
UV-vis	ultraviolet–visible spectroscopy
UV-vis-NIR	ultraviolet–visible–near Infrared spectroscopy
XANES	X-ray absorption near edge spectroscopy
XAS	X-ray absorption spectroscopy
XPS	X-ray photoelectron spectroscopy
XRD	X-ray diffraction