LIST ABBREVIATIONS AND SYMBOLS USED

AFM	atomic force microscopy
Al_2O_3	Aluminium oxide
Ag^{-1}	Ampere per gram
Ag	Silver
Au	Gold
AgCl	Silver chloride
4-AP	4-aminophenol
CH_4	methane
cm^{-1}	per centimetre
$cm^3\ g^{-1}$	cubic centimetre per gram
$cm^2\ V^{-1}\ s^{-1}$	centimetre square per volt per second
C_0	initial concentration
C_e	equilibrium concentrations
$CHCl_3$	chloroform
CMG	chemically modified graphene
CNTs	carbon nanotubes
CO	carbonmonooxide
CO_2	carbondioxide
Co	cobalt
Co_3O_4	Cobalt oxide
Cu	copper
CuCl	cuprous chloride
CuO	copper oxide
Cu_2O	cuprous oxide
CV	cyclic voltammetery
CVD	chemical vapor deposition
C_s	specific capacitance
DI	deionised water
DLS	dynamic light scattering
DETA	diethylenetriamine
DMFCs	direct methanol fuel cells
EIS	electrochemical impedance spectroscopy

ECSA	electrochemically active surface area
EDLC	electrical double layer capacitance
eV	electron volt
Fg^{-1}	Faraday per gram
Fe	Iron
Fe_2O_3	Iron oxide
FTIR	Fourier transform infrared
g	gram
GCE	glassy carbon electrode
GCD	galvanostatic charge-discharge
Ge	Germenium
GO	graphene oxide
GPa	Gigapascal
GS	graphene sponge
h	hours
H_2	Hydrogen gas
HER	hydrogen evolution reaction
H_2O_2	Hydrogen peroxide
HNO_3	Nitric acid
H_2SO_4	Sulfuric acid
HCl	Hydrochloric acid
Hz	Hertz
I	net current
Ir	Irridium
I_D/I_G	ratio of intensities of D and G bands in Raman spectrum
K	Kelvin
k	rate constant
K_L	Langmuir constants
K_F	Freundlich constants
kJ mol^{-1}	kilojoules per mole
KBr	Potassium bromide
$KMnO_4$	Potassium permanganate
KOH	Potassium hydroxide
m	metre
m	mass

M	molar
mA	miliampere
mA/cm^2	miliampere per centimeter square
mg	milligram
$m^2 g^{-1}$	square metre per gram
min	minutes
mL	milliliter
mmol	millimolar
MnO	Manganese oxide
MoO_3	Molybedenum trioxide
MO	methyl orange
MV	methyl violet
mV	millivolt
$mV s^{-1}$	millivolt per second
MWCNT	multiwalled carbonnano tube
Na	Sodium
N_2	Nitrogen
$NaBH_4$	Sodium borohydride
nm	nanometer
4-NP	4-nitrophenol
$NaNO_3$	Sodium nitrate
NaOH	Sodium hydroxide
Ni	Nickel
NiO	Nickel oxide
$Ni(OH)_2$	Nickel hydroxide
ORR	oxygen reduction reaction
Pd	Paladium
Pt	Platinum
PDDA	poly (diallyldimethylammonium chloride)
PECVD	plasma enhanced chemical vapor deposition
PPy	polypyrrole
PPD	*p*-phenylenediamine
PVP	polyvinylpyrrolidone
q_e	adsorption capacity
q_m	maximum adsorption capacity

rGO	reduced graphene oxide
Rh	Rhodium
Ru	Ruthenium
RuO_2	Ruthenium oxide
R_{CT}	interfacial charge-transfer resistance
R_S	series resistance
R_W	Warburg impedance
s	seconds
Sn	Tin
SnO_2	Tin oxide
S cm^{-1}	Siemens per centimetre
SEM	scanning electron microscope
SG	sulfonated graphene
SWNT	singlewalled carbonnano tube
T	absolute temperature
TEM	transmission electron microscope
$TiCl_3$	Titanium trichloride
TiO_2	Titanium dioxide
UV	ultraviolet
UV-vis	ultraviolet-visible
V	voltage
v	volume
V_{max}	maximum voltage
wt%	weight percentage
X	degradation factor
XRD	X-ray diffraction
XPS	X-ray photoelectron spectroscopy
Z'	impedance (real)
Z''	impedance (imaginary)
ZnO	Zinc oxide
ZrO_2	Zirconium oxide
$ZrOCl_2$	Zirconium oxychloride
$^{\circ}C$	degree Celsius
θ	elevation angle
λ_{max}	maximum absorption wavelength

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