

## LIST ABBREVIATIONS AND SYMBOLS USED

$A$	geometric area of the electrode
Ag	Silver
AgCl	Silver chloride
AM	air mass
APS	Ammonium persulfate
BET	Brunauer-Emmett-Teller
BJH	Barrett-Joyner-Halenda
BPO	Benzoyl peroxide
$\text{cm}^{-1}$	per centimetre
$\text{cm}^3 \text{g}^{-1}$	cubic centimetre per gram
$C^*$	bulk concentration of triiodide species
$C_1$	capacitive element 1
$C_2$	capacitive element 2
$C\mu$	chemical capacitance
$C\mu, CE$	chemical capacitance at the counter electrode/electrolyte interface
CB	carbon black
CD	carbon dot
CdS	Cadmium sulphide
CdTe	Cadmium telluride
CIGS	Copper indium gallium selenide
$\text{Cu(In,Ga)Se}_2$	Copper indium gallium diselenide
D	direct radiation
$D$	diffusion coefficient of triiodide ions
$D'$	power density at the Sun's surface
DLS	dynamic light scattering
DSSC	dye sensitized solar cell
$E^{\circ'}$	formal potential
$E_A$	activation energy
$E_{bg}$	electrical bandgap
$E_{bgij}$	bandgap of the hetero-junction
$E_C$	conduction band edge of the semiconductor
$E_F$	energy of the quasi-Fermi level of the semiconductor
$E_{redox}$	redox potential
$E_{opt}$	optical bandgap

$E_{PP}$	peak-to-peak separation voltage
EIS	electrochemical impedance spectroscopy
EM	electromagnetic
$F$	Faraday constant
FE-SEM	field emission scanning electron microscope
$FF$	fill factor
FTIR	Fourier transform infrared
FTO	fluorine doped tin oxide
g	gram
G	global
GO	graphene oxide
GOS	graphene oxide nanosheet
GW	gigawatt
h	hours
$h$	Plank constant
$H_O$	solar irradiance
$H_{Sun}$	distance of the object from the Sun
$H_2O_2$	Hydrogen peroxide
$H_2PtCl_6$	Chloroplatinic acid
$H_2PtI_6$	Iodoplatinic acid
$H_2SO_4$	Sulfuric acid
HCl	Hydrochloric acid
HOMO	highest occupied molecular orbital
HRTEM	high resolution transmission electron microscope
Hz	Hertz
I	intrinsic
I <sup>-</sup>	iodide
I <sub>3</sub> <sup>-</sup>	triiodide
I <sub>2</sub>	Iodine
$I$	net current
$I_D$	diode current
$I_D/I_G$	ratio of intensities of D and G bands in Raman spectrum
$I_L$	photogenerated current
$I_O$	dark saturation current
$I_P$	peak current
$I_{Pa}$	anodic peak current density
$I_{Pc}$	cathodic peak current density

$I_{sc}$	short-circuit current
IEA	International Energy Agency
IPCE	incident photon-to-current efficiency
ITO	Indium tin oxide
$I-V$	current-voltage
$J_0$	exchange current density
$J_{lim}$	limiting current density
$J_{max}$	maximum current density
$J_{sc}$	short-circuit current density
$J-V$	current density-voltage
$k$	Boltzmann constant
K	Kelvin
$K'$	constant in Randles-Sevcik equation
$k_{eff}$	rate constant
$\text{kJ mol}^{-1}$	kilojoules per mole
$\text{kW m}^{-2}$	kilowatt per square metre
KBr	Potassium bromide
KI	Potassium iodide
$\text{KMnO}_4$	Potassium permanganate
KRICT	Korea Research Institute of Chemical Technology
$L$	thickness of the polymer gel electrolyte
LE	liquid electrolyte
$\text{Li}^+$	Lithium ion
$\text{LiClO}_4$	Lithium perchlorate
LiI	Lithium iodide
LUMO	lowest unoccupied molecular orbital
m	metre
M	molar
mg	milligram
$\text{m}^2 \text{g}^{-1}$	square metre per gram
min	minutes
mL	milliliter
mmol	millimolar
mV	millivolt
$\text{mV s}^{-1}$	millivolt per second
$\text{mW cm}^{-2}$	milliwatt per square centimetre
MHz	megahertz

MMA	Methyl methacrylate
MPI	1-Methyl 3-propylimidazolium iodide
$n$	number of electrons involving in the charge transfer process
$n_c$	free electron density at the conduction band of the semiconductor
nm	nanometre
$N_2$	Nitrogen
$N_C$	density of accessible state of the semiconductor's conduction band
N3	cis-Bis(isothiocyanato) bis(2,2'-bipyridyl-4,4'-dicarboxylato ruthenium(II)
N719	Di-tetrabutylammonium cis-bis(isothiocyanato)bis(2,2'-bipyridyl-4,4'-dicarboxylato) ruthenium(II)
$NaBH_4$	Sodium borohydride
$Na_2CO_3$	Sodium carbonate
$NaNO_3$	Sodium nitrate
NMP	N-methyl 2-pyrrolidone
OCVD	open-circuit voltage decay
Ox-1	oxidation peak 1
Ox-2	oxidation peak 2
$P_{in}$	power of the incident light
PAni	Polyaniline
PAniNT	Polyaniline nanotube
PCE	photoconversion efficiency
PEDOT	Poly(3,4-ethylenedioxythiophene)
PEDOT:PSS	Poly(3,4-ethylenedioxythiophene) polystyrene sulfonate
PEG	Poly(ethylene glycol)
PEO	Poly(ethylene oxide)
PGE	polymer gel electrolyte
PL	photoluminescence
PMMA	Poly(methyl methacrylate)
Pt	Platinum
$PtI_4$	Platinum(IV) iodide
PV	photovoltaic
PVP	Polyvinylpyrrolidone
$q$	charge
rGO	reduced graphene oxide
rGOA	reduced graphene oxide aerogel
rpm	rotations per minute

$R$	universal gas constant
$R_b$	bulk resistance of the polymer gel electrolyte
$R_{CT}$	charge transfer resistance at the electrolyte/photoanode interface
$R_{CT,CE}$	charge transfer resistance at the electrolyte/counter electrode interface
$R_{CT,Pt}$	charge transfer resistance at the electrolyte/Pt counter electrode interface
$R_S$	series resistance
$R_{SH}$	shunt resistance
$R_{Sun}$	radius of the Sun
$R_W$	Warburg impedance
RB	round-bottom
Red-1	reduction peak 1
Red-2	reduction peak 2
s	seconds
$S\text{ cm}^{-1}$	Siemens per centimetre
SCE	standard calomel electrode
SEM	scanning electron microscope
SI	Système international (d'unités) or the International System of Units
SQL	Shockley-Queisser limit
STP	standard temperature and pressure
$T$	absolute temperature
TBP	t-Butyl pyridine
TCO	transparent conducting oxide
TEM	transmission electron microscope
$TiCl_4$	Titanium tetrachloride
$TiO_2$	Titanium dioxide
UNIST	Ulsan National Institute of Science and Technology
UV	ultraviolet
UV-vis	ultraviolet-visible
$V$	voltage
V	Volt
$V_{max}$	maximum voltage
$V_{OC}$	open-circuit voltage
$\omega_{max}$	peak frequency of the semicircle in the lower frequency regions of the Nyquist plot
wt%	weight percentage
$W\text{ m}^{-2}$	Watt per square metre
XRD	X-ray diffraction

XPS	X-ray photoelectron spectroscopy
$Z'$	impedance (real)
$Z''$	impedance (imaginary)
Z907	cis-Bis(isothiocyanato)(2,2'-bipyridyl-4,4'-dicarboxylato)(4,4'-diononyl-2'-bipyridyl) ruthenium(II)
$^{\circ}\text{C}$	degree Celsius
$\eta$	efficiency
$\theta$	elevation angle
$\lambda_{ex}$	excitation wavelength
$\lambda_{max}$	maximum absorption wavelength
$\mu\text{m}$	micrometre
$\nu$	frequency
$\nu'$	scan rate
$\sigma$	ionic conductivity
$\tau_{eff}$	electron lifetime
$\Omega \text{ cm}^{-2}$	Ohm per square centimetre

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