

I would like to dedicate this dissertation to my family who has supported and encouraged me throughout this endeavour: thank you for your love and support throughout my entire life and helping me realize who I am today!



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It is certified that the work contained in the thesis titled “**Studies on Development of rGO Supported Chalcogenide Photoelectrocatalysts for Reduction of Water to Hydrogen by Visible Light**” by “**Rajiv Ranjan**” has been carried out under my supervision and that this work has not been submitted elsewhere for a degree.

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I, **Rajiv Ranjan**, certify that the work embodied in this thesis is my own bonafide work and carried out by me under the supervision of **Prof. A.S.K. Sinha** from Oct-2012 to June-2019, at the **Department of Chemical Engineering & Technology**, Indian Institute of Technology (BHU), Varanasi. The matter embodied in this thesis has not been submitted for the award of any other degree/diploma. I declare that I have faithfully acknowledged and given credits to the research workers wherever their works have been cited in my work in this thesis. I further declare that I have not wilfully copied any other's work, paragraphs, text, data, results, etc., reported in journals, books, magazines, reports dissertations, theses, etc., or available at websites and have not included them in this thesis and have not cited as my own work.

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Table of contents

Certificate		iv-vi
Acknowledgement		vii
Table of content		xi
List of table		xiv
List of figure		xvi
List of notations, nomenclatures, symbols		xvii
Preface		xx
Chapter 1	Introduction	1-14
1.1	General	1
1.2	Hydrogen as an energy carrier	5
1.3	Hydrogen production technique	6
1.4	Solar Hydrogen	10
Chapter 2	Literature Review	15-46
2.1	Semiconductor electrolyte interface	15
2.2	Fabrication of electrode	19
2.3	Photoelectrocatalyst	23
2.4	Charge recombination and its prevention	29
2.5	Future scope of work based on the literature review	44
2.6	Objectives of present work	46
Chapter 3	Section - 1	47-80
I.3.1	General	48
I.3.2	Experimental	50
I.3.3	Activity of Photoelectrodes	52
I.3.4	Characterization Techniques	53
	I.3.4.1 FTIR studies	53
	I.3.4.2 X-Ray Diffraction (XRD) studies	55
	I.3.4.3 Diffuse Reflectance Spectroscopy	56
	I.3.4.4 Photoluminescence spectroscopy (PL)	57
	I.3.4.5 TEM and SAED studies	57
	I.3.4.6 XPS studies	58
	I.3.4.7 EIS studies	60
	I.3.4.8 Mott-Schottky Analysis	61
I.3.5	Results and Discussion	62
	I.3.5.1 Photoelectrochemical Activity	62
I.3.6	Characterization studies	65
	I.3.6.1 FTIR studies	65
	I.3.6.2 X-Ray Diffraction (XRD) studies	66
	I.3.6.3 Diffuse Reflectance Spectroscopy	70
	I.3.6.4 XPS studies	71
	I.3.6.5 EIS studies	74
	I.3.6.6 Mott-Schottky Analysis	77
I.3.7	Mechanism	79
	Section II	81-110
II.3.1	General	82
II.3.2	Experimental	84
II.3.3	Activity of Photoelectrodes	86
II.3.4	Characterization Techniques	87
II.3.5	Results and Discussion	87

Table of contents

II.3.5.1	Photoelectrochemical activity	87
II.3.5.2	Characterization studies	89
II.3.5.2.1	FTIR studies	89
II.3.5.2.2	X-Ray Diffraction (XRD) studies	91
II.3.5.2.3	HRSEM	93
II.3.5.2.4	TEM and HRTEM analyses	95
II.3.5.2.5	Diffuse Reflectance Spectroscopy	98
II.3.5.2.6	Photoluminescence studies	99
II.3.5.2.7	XPS studies	100
II.3.5.2.8	EIS studies	106
II.3.5.2.9	Mott-Schottky Analysis	107
II.3.6	Mechanism	110
	Section -III	111-140
III.3.1	General	112
III.3.2	Experimental	116
III.3.3	Activity of Photoelectrodes	118
III.3.4	Characterization Techniques	119
III.3.5	Results and Discussion	119
III.3.5.1	Photoelectrochemical activity	119
III.3.5.2	Characterization studies	121
III.3.5.2.1	FTIR studies	121
III.3.5.2.2	XRD studies	123
III.3.5.2.3	Morphology studies	125
III.3.5.2.4	Diffuse Reflectance Spectroscopy	129
III.3.5.2.5	XPS studies	130
III.3.5.2.6	EIS studies	135
III.3.5.2.7	Mott-Schottky Analysis	136
III.3.6	Mechanism	138
4.1	Conclusions	141
	References	145
	List of Publications	180

List of notations, nomenclatures, symbols

ΔH	Heat of reaction
BE	Binding energy
C_i	Interface capacitance
CB	Conduction band
d_{hkl}	Interplanar spacing
e^-	Electron
E_{BE}	Energy of the involved bound electron state
E_F	Fermi energy
E_g	Band gap energy
E_{KE}	Energy of the ejected electron
d_{hkl}	Interplanar spacing
e^-	Electron
E_{BE}	Energy of the involved bound electron state
E_F	Fermi energy
E_g	Band gap energy
E_{KE}	Energy of the ejected electron
F	Faraday constant
FWHM	Full width at half maximum
GHG	Green House gases
GO	Graphene oxide
h	Plank constant
h^+	Hole
IEA	International energy agency
$J/year$	Joule per year
k	Rate constant
K	Scherrer constant
MNRE	Ministry of new and renewable energy
$Mtoe$	Million tonnes
OSR	Oxidative steam reforming
PEC	Photo-electrochemical
POX	Partial oxidation reaction
PV	Photovoltaic
PZT	Piezoelectric transducers
R_I	Resistance associated at interface
rGO	Reduced graphene oxide

R_s	Resistance due to solution/ electrolyte
SR	Steam reforming
VB	Valence band
Z	Impedance
α	optical absorption coefficient
β	Broadening
λ	Wave length
ν	Frequency of light
Φ_m	Work function of the metal
Φ_s	Work function of the semiconductor
Φ_b	Height of the potential barr

List of Table

Table no.	Table caption	Page no.
Table 1.1	Environmental effects of fuels	4
Table 1.2	Combustion properties of hydrocarbon	5
Table 1.3	Combustions values of hydrogen and fossil fuels	6
Table I.3.1	Summary of catalyst and electrode	52
Table I.3.2	Characterization techniques used in present study	62
Table- I.3.3	XRD Results catalysts for CdS	68
Table- I.3.4	c/a ratios and crystallize size of CdS in different catalyst.	69
Table I.3.5	Band Gap of various catalysts	70
Table I.3.6	Peak position of Cd-3d and S-2p in catalysts	74
Table I.3.7	Peak position of Cd-3d and S-2p in electrode	76
Table I.3.8	List of circuit parameters	77
Table I.3.9	Flat band potential and carrier density of catalyst photocathode	79
Table II.3.2	Summary of Catalysts/electrodes prepared in present study	87
Table II.3.2	Results of XRD analysis of CdS in catalysts	92
Table II.3.3	Unit cell parameters and crystallize size of CdS in catalysts	92
Table II.3.4	Peak positions of Cd 3d and S-2p in catalyst	104
Table II.3.5	Peak positions of Cd 3d and S-2p in electrodes	105
Table II.3.6	Flat band potential and carrier density of catalyst photocathode	108
Table III.3.1	Performances of catalysts reported	115
Table III.3.2	Summary of Catalysts/electrodes prepared in present study	118
Table III.3.3	Band gap of photocathodes	130
TableIII.3.4(a)	Peak position of Mo 3d in different catalyst	134
TableIII.3.4(b)	Peak position of S 2p in different catalyst	134
TableIII.3.4(c)	Peak position of Cd ²⁺ in different catalyst	134
Table III.3.5	Flat band potential and carrier density of catalyst photocathode	137

List of Table

Table no.	Table caption	Page no.
Table 1.1	Environmental effects of fuels	4
Table 1.2	Combustion properties of hydrocarbon	5
Table 1.3	Combustions values of hydrogen and fossil fuels	6
Table I.3.1	Summary of catalyst and electrode	52
Table I.3.2	Characterization techniques used in present study	62
Table- I.3.3	XRD Results catalysts for CdS	68
Table- I.3.4	c/a ratios and crystallize size of CdS in different catalyst.	69
Table I.3.5	Band Gap of various catalysts	70
Table I.3.6	Peak position of Cd-3d and S-2p in catalysts	74
Table I.3.7	Peak position of Cd-3d and S-2p in electrode	76
Table I.3.8	List of circuit parameters	77
Table I.3.9	Flat band potential and carrier density of catalyst photocathode	79
Table II.3.2	Summary of Catalysts/electrodes prepared in present study	87
Table II.3.2	Results of XRD analysis of CdS in catalysts	92
Table II.3.3	Unit cell parameters and crystallize size of CdS in catalysts	92
Table II.3.4	Peak positions of Cd 3d and S-2p in catalyst	104
Table II.3.5	Peak positions of Cd 3d and S-2p in electrodes	105
Table II.3.6	Flat band potential and carrier density of catalyst photocathode	108
Table III.3.1	Performances of catalysts reported	115
Table III.3.2	Summary of Catalysts/electrodes prepared in present study	118
Table III.3.3	Band gap of photocathodes	130
TableIII.3.4(a)	Peak position of Mo 3d in different catalyst	134
TableIII.3.4(b)	Peak position of S 2p in different catalyst	134
TableIII.3.4(c)	Peak position of Cd ²⁺ in different catalyst	134
Table III.3.5	Flat band potential and carrier density of catalyst photocathode	137

List of figure

Figure no.	Figure caption	Page no
Fig 1.1	Years of global coal, oil and natural gas left, reported as the reserves-to-product (R/P) ratio which measures the number of years of production left based on known reserves and annual production levels in 2015.	2
Fig 1.2	World energy consumption	3
Fig 1.3	Flow diagram of steam reforming	7
Fig 1.4	Flow diagram of partial oxidation process.	9
Fig 1.5	Flow diagram of oxidative steam reforming.	10
Fig 1.6	Schematic Diagram for dissociation of water by PV cell	11
Fig 1.7	Schematic Diagram for dissociation of water by Photocatalytic process	12
Fig 1.8	Schematic Diagram for dissociation of water by Photobiological process	13
Fig 1.9	Band structure for water splitting reaction	14
Fig 2.1	Band Bending of semiconductor	15
Fig 2.2	The semiconductor – electrolyte interface before (LHS) after (RHS) for (a) n-type semiconductor (b) p – type semiconductor	16
Fig 2.3	Effect of bias potential on semiconductor – electrolyte interface	18
Fig 2.4	Conduction and valance band edge position of semiconductor	24
Fig 2.5	Schematic diagram for charge transfer between two semiconductors	32
Fig 2.6	Electronic structure of Graphene Lattice	35
Fig 2.7	Oxidation of Graphene to produce Graphene oxide	35
Fig 3.1	Line diagram for experimental set-up	54
Fig. 3.2	Experimental set up in operational mode	54
Fig. 3.3	Summary of the experimental procedure for producing XPS depth profiles	59
Fig. 3.4	Basic component of Nyquist plot of electrochemical impedance spectroscopy	60
Fig I.3.1	LSV test of various catalysts in S^{2-} and $S_2O_3^{2-}$ electrolyte: E_x & E_x^* are without light and with light	64
Fig I.3.2	FTIR spectra of catalyst	66
Fig I.3.3	FTIR spectra of electrode prepared by catalyst powder	67
Fig I.3.4	XRD patterns of catalysts CdS, (c): Cubic phase of CdS	69
Fig I.3.5	DRS results of catalysts	71
Fig I.3.6	XPS spectra of S-2p (I) and Cd-3d (II) in catalyst powder	74
Fig I.3.7	XPS spectra of S-2p (I) and Cd-3d (II) for electrode E_2 . (* surface etched for 60s)	75
Fig I.3.8	XPS spectra of S-2p (I) and Cd-3d (II) for electrode E_3 . (* surface etched for 60s)	75
Fig I.3.9	EIS of various electrodes at 0.2 V vs SHE	77
Fig I.3.10	Equivalent circuit diagram of various electrodes	77
Fig I.3.11	Mott-Schottky plot of catalyst at 1 kHz in S^{2-} and SO_3^{2-} electrolyte	79
Fig I.3.12	Proposed mechanism of the system	80
Fig II.3.1	LSV test of catalysts in S^{2-} and $S_2O_3^{2-}$ electrolyte: E_x & E_x^* are without and with light	89
Fig II.3.2	FTIR spectra of Catalysts	90
Fig II.4.3	FTIR spectra of electrodes	91
Fig II.3.4	XRD pattern of catalysts	93

List of figure

Fig II.3.5	HRSEM images of catalysts	94
Fig II.3.6	Color map of different catalysts using HRSEM	95
Fig II.3.7	TEM image of a: Cat-1, b: Cat-2, c: cat-3 and d: Cat-4	96
Fig II.3.8	Histogram of particle size of catalyst	96
Fig II.3.9	SAED of a: Cat-1, b: Cat-2, c: cat-3 and d: Cat-4	97
Fig II.3.10	HRTEM images of Cat-1(A), Cat-2(B), cat-3(C) and Cat-4(D)	97
Fig II.3.11	Absorbance spectra and Band gap (inset) of CdS in different catalyst	98
Fig II.3.12	Photoluminescence spectra of catalysts	99
Fig II.3.13	Photoluminescence spectroscopy of electrodes	100
Fig II.3.14	XPS spectra of Cd-3d and S-2p in catalysts	103
Fig II.3.15(a)	XPS spectra of S-2p and Cd-3d for electrode E ₂ . (* surface etched for 60s)	105
Fig II.3.15(b)	XPS spectra of S-2p and Cd-3d for electrode E ₃ . (* surface etched for 60s)	106
Fig II.3.15(c)	XPS spectra of S-2p and Cd-3d for electrode E ₄ . (* surface etched for 60s)	107
Fig II.3.16	EIS of various electrodes at 0.2 V vs SHE	107
Fig II.3.17	Mott-Schottky plot of catalyst at 1 kHz in S ²⁻ and SO ₃ ²⁻ electrolyte	109
Fig II.3.18	Proposed mechanism of the system	110
Fig III.3.1	Result of Linear Sweep Voltammetry in Dark and light (marked as *) in S ²⁻ and SO ₃ ²⁻ electrolyte	120
Fig III.3.2	Schematic diagram of the electrochemical process	121
Fig III.3.3	FTIR spectra of catalysts	122
Fig III.3.4	XRD spectra of catalysts C: Cubic phase CdS H: Hexagonal phase CdS M: hexagonal MoS ₂	124
Fig III.3.5	HRSEM images of catalysts	125
Fig III.3.6	TEM and corresponding SAED of catalysts	127
Fig III.3.7	Schematic diagram of catalysts preparation	128
Fig III.3.8	DRS and Tauc plot of catalyst	129
Fig III.3.9a	XPS spectra of Mo-3d and S-2p in different catalyst I: Mo ⁴⁺ (1T), II: Mo ⁴⁺ (2H), III, Mo ⁶⁺ 1: For S ²⁻ (for MoS ₂ 2H and CdS), 2: For S ²⁻ (For MoS ₂ 1T)	132
Fig III.3.9b	XPS spectra of Cd ²⁺ in catalyst 3 and 4	133
Fig III.3.10	EIS results of catalyst at -0.2V vs SHE in S ²⁻ and SO ₃ ²⁻ electrolyte	135
Fig III.3.11	Mott-Schottky plot of catalyst at 1.0 kHz in S ²⁻ and SO ₃ ²⁻ electrolyte	137
Fig III.3.12	Schematic diagram of charge transfer in cat-4	139
