

CONTENTS**Page**

DECLARATION	i	
ACKNOWLEDGEMENT	ii	
CONTENTS	iv	
ABBREVIATIONS	vii	
ABSTRACT	ix	
Chapter 1	CONCEPT AND THEORETICAL ASPECT OF SOLAR ENERGY CONVERSION	
	1	
1.1	Introduction	1
1.2	Existing solid state photovoltaic devices	14
1.2.1	Schottky junction solar cells	14
1.2.2	p-n junction solar cells	15
1.2.3	Heterojunction solar cells	16
1.2.4	Hydrogenated Amorphous Silicon p-i-n Junction Solar Cells	18
1.3	Theoretical Aspects of Photoelectrochemical (PEC) cells	18
1.3.1	Charge separation and formation of schottky barrier at the semiconductor/electrolyte interface	18
1.3.2	Principles behind the PEC cell	23
1.3.3	Factors determining the power conversion efficiency and strategies employed to improve the efficiency in PEC cells	26

1.3.4	Mechanistic Aspects of dye-sensitized PEC cells	29
1.4	Mechanistic background of a dye-sensitized solid-state photovoltaic cell	31
Chapter 2	A NANO-POROUS SOLID-STATE PHOTOVOLTAIC CELL SENSITIZED WITH COPPER CHLOROPHYLLIN	33
2.1	Introduction	33
2.2	Experimental	34
2.3	Results and Discussion	36
Chapter 3	THE SUPPRESSION OF THE RECOMBINATION OF PHOTOGENERATED CARRIERS IN A DYE-SENSITIZED NANO-POROUS SOLID-STATE PHOTOVOLTAIC CELL	47
3.1	Introduction	47
3.2	Experimental	48
3.3	Results and Discussion	49
Chapter 4	SEMICONDUCTOR PHOTOCATALYSIS FOR HEAVY METAL REMOVAL FROM AQUEOUS MEDIUM	57
4.1	Introduction	57
4.2	Principles of Photocatalysis	61
4.2.1	Catalytic behavior of semiconductor particle	62

4.2.2	Photoinduced Charge Transfer Process on the Surface of Catalysts	65
4.2.3	Heterogeneous Photocatalysis	65
4.2.4	Putting photocatalysis to work - Search for a practical device for heavy metal removal from aqueous media	68
4.2.5	Kinetics of photocatalytic heavy metal removal process	75
4.3	Experimental	76
4.3.1	Optimization of heavy metal removal process	76
4.3.2	Preparation of photolysis solutions	78
4.3.3	Preparation of synthetic metals	78
4.3.4	Preparation of catalyst supported films	78
4.3.5	UV-Irradiation procedure	79
4.3.6	Experiments in sunlight	82
4.3.7	Analytical techniques	82
4.4	Results and Discussion	86
4.4.1	Photocatalytic method for removal of copper from contaminated water	86
4.4.2	Photocatalytic lead removal in water with TiO ₂ supported polypropylene films	104
	CONCLUSION	125
	REFERENCES	127
	RESEARCH PUBLICATIONS	140

