## Contents

Abete		page I		
Abstract Acknowledgements				
Contents				
List of Figures				
List of Tables				
	f Symbols	ix		
	Abbreviations	х		
Chant	er 1: Introduction			
1.1	Nanomaterials	1		
1.2	Nanomaterials for Energy Applications	1		
1.3	Nanomaterials for Biosensing Applications	6		
1.4	Electrode Fabrication using Functional Inks	8		
1.5	Literature Survey	9		
1.6	Scope of the Thesis Work	20		
1.8	Conclusions	21		
Chant	er 2: Experimental Techniques and Methods			
2.1	Introduction	23		
2.2	Material Characterization Techniques	23		
2.3	Electroanalytical Techniques	27		
-	2.3.1 Voltammetric Techniques	27		
	2.3.2 Galvanostatic Techniques	28		
	2.3.3 Pulse Techniques	28		
	2.3.4 Electrochemical Impedance Spectroscopy	30		
	2.3.5 Key Parameters Involved in OER, Supercapacitors and Biosensing	31		
2.4	Fabrication of Electrodes	35		
2.5	Conclusions	36		
Chapt	er 3: Ni-based Enzymeless and Transparent Glucose Sensor			
3.1	Introduction	37		
3.2	Objectives of the Work	38		
3.3	Experimental	38		
3.4	Results and Discussion	39		
	3.4.1 Characterization and Fabrication of Ni-BT Functionalized Au Electrode	39		
	3.4.2 Electrochemical Measurements	43		
	3.4.3 Fabrication of Au Mesh Electrodes	44		
	3.4.4 Glucose Sensing Performance of Au plain and Au Mesh Electrodes	45		
3.5	Conclusions	51		
Chapt	er 4: Layer-by-layer Coating of Co/Ni Inks for OER			
4.1	Introduction	53		
4.2	Objectives of the Work	54		
4.3	Experimental	54		
4.4	Results and Discussion	55		
	4.4.1 Characterization of Co Hexadecanethiolate (Co-HDT)	55		
	4.4.2 Fabrication of $Co_3O_4/CC$ Electrodes by LbL Coating of Co-HDT	57		
	4.4.3 Electrochemical Performance of $Co_3O_4/CC$ Electrodes	60		
	4.4.4 Material Characterization and Fabrication of NiO/CC Electrodes	63		
	4.4.5 Electrochemical Performance of NiO/CC Electrodes	64		
4.5	Conclusions	66		

Chapter 5:	Fabrication	of Nickel	Cobaltite	Nanoplates	for OER
chapter ji	abrication	of mener	cobuitite	nanopiaces	<i>,</i>

5.1 Introduction	
------------------	--

5.2 Objectives of the Work

5.3	Experimental	68	
5.4	Results and Discussion	69	
	5.4.1 Characterization of Mixed Ni-BT and Co-HDT Inks	69	
	5.4.2 Characterization and Fabrication of NCO oxide Electrodes	71	
	5.4.3 Electrochemical Performance Towards OER	74	
	5.4.4 Magnetism Induced OER Measurements	79	
5.5	Conclusions	80	
Chapt	ter 6: Biomolecular Sensing using Nickel Cobaltite Nanoplates		
6.1	Introduction	81	
6.2	Objectives of the Work	82	
6.3	Experimental	82	
6.4	Results and Discussion	83	
	6.4.1 Fabrication of $Co_3O_4/CC$ , NiO/CC and NiCo $_2O_4/CC$ Electrodes	83	
	6.4.2 Electrochemical Performance of NiCo $_2O_4/CC$	87	
	6.4.3 Individual and Simultaneous Detection of DA and UA	89	
6.5	Conclusions	93	
Chapt	er 7: Polystyrene to Graphitic Carbon for Supercapacitors		
7.1	Introduction	95	
7.2	Objectives of the Work	96	
7.3	Experimental	96	
7.4	Results and Discussion	97	
	7.4.1 Synthesis of graphitic carbon and mechanism	97	
	7.4.2 Material Characterization of the Synthesized Graphitic Carbon	98	
	7.4.3 Electrochemical Properties of the Graphitic Carbon	103	
	7.4.4 Energy Storage Performance of Graphitic Carbon Derived from Waste Polystyrene	107	
7.4	Conclusions	109	
Chapter 8: Summary and Future Outlook			
Appendix I: List of Publications			
References			