Chapter 1
General Introduction and Review of Literature

1.1 OVERVIEW OF BIOFUEL CELLS 1
1.2 TYPES OF BIOFUEL CELLS 6
   1.2.1 Abiotically catalyzed biofuel cells 6
   1.2.2 Enzymatic biofuel cells 6
   1.2.3 Microbial biofuel cells 10
1.3 TYPES OF ENZYMES BASED ON ELECTRON TRANSFER METHOD 10
1.4 THE OPERATING PRINCIPLES OF ENZYMATIC BIOFUEL CELLS 13
1.5 APPLICATIONS OF BIOFUEL CELLS 17
   1.5.1 Transport and energy generation 17
   1.5.2 Implantable power sources 17
   1.5.3 Wastewater treatment 17
   1.5.4 Robots 19
1.6 HURDLES IN THE APPLICATION OF BIOFUEL CELLS 19
Chapter 2

Electrochemical Study of Single Wall Carbon Nanotubes/Graphene/Ferritin Composite for Biofuel Cell Applications

2.1 INTRODUCTION 63

2.2 Experimental 65

2.2.1 Reagents and instruments 65

2.2.2 Preparation of graphene dispersion 65

2.2.3 Preparation of single wall carbon nanotubes dispersion 65

2.2.4 Preparation of a mixture of graphene and single wall carbon nanotubes 66

2.2.5 Preparation of single wall carbon nanotubes /graphene/ ferritin/ glucose oxidase electrodes 66

2.3 RESULTS AND DISCUSSION 68

2.4 CONCLUSION 76

➢ REFERENCES 77
Chapter 3
Fabrication of Bioanode by using Electrically Conducting Polythiophene via Entrapment Technique

3.1 INTRODUCTION 79
3.2 Experimental 82
  3.2.1 Reagents and instruments 82
  3.2.2 Preparation of polythiophene/ferritin/glucose oxidase electrodes 82
3.3 RESULTS AND DISCUSSION 85
  3.3.1 Surface morphology 85
  3.3.2 Electrochemical properties 85
3.4 CONCLUSION 92
  REFERENCES 94

Chapter 4
Electrospun Polyaniline/Polyvinyl alcohol/Multiwalled Carbon Nanotubes Nano Fibers as Promising Bioanode Material for Biofuel Cell Applications

4.1 INTRODUCTION 97
4.2 EXPERIMENTAL 100
  4.2.1 Reagents and instruments 100
  4.2.2 Synthesis of PANI/PVA/MWCNTs electrospun fibers 100
  4.2.3 Electrode preparation 101
4.3 RESULTS AND DISCUSSION 105
  4.3.1 Surface morphology 105
  4.3.2 Electrochemical properties of synthesized electrode materials 105
  4.3.3 Stability and reproducibility 113
4.4 CONCLUSION 115
  REFERENCES 116
Chapter 5
Biocompatible Mediated Bioanode Composed of Conducting Polymer
Matrix, Functionalized Graphene Integrated with Enzyme for Biofuel
Cell Applications

5.1 INTRODUCTION

5.2 EXPERIMENTAL
5.2.1 Reagents and instruments
5.2.2 Synthesis of sulfonated graphene oxide
5.2.3 Synthesis of poly(3,4-ethylenedioxythiophene)-poly(styrenesulphonate)/ sulfonated graphene oxide
5.2.4 Fabrication of poly(3,4-ethylenedioxythiophene)-poly(styrenesulphonate)/ sulfonated graphene oxide/ferritin/glucose oxidase electrodes

5.3 RESULTS AND DISCUSSION
5.3.1 Surface morphology
5.3.2 Electrochemical properties of synthesized electrode materials

5.4 CONCLUSION

➢ REFERENCES

Appendixes

➢ Appendix – I LIST OF ABSTRACT PUBLISHED IN SEMINAR AND
CONFERENCES
➢ Appendix – II LIST OF PUBLICATIONS
➢ Appendix - III Reprints of Research Papers