

LIST OF FIGURES

Figure	Page
1 Schematic of PEM Fuel Cell	2
2 Molecular Structure of chitosan	3
3 Molecular structures of chitosan oligomers	14
4 The energy gap of (a) Metal (b) Metal semiconductor (c) Conducting polymer (d) Insulator	18
5 Atomic Numbering of chitosan Membrane.....	20
6 Total energy of chitosan oligomers optimization: (a) monomer (b) dimer (c) trimer (d) tetramer	23
7 The relative total energy of chitosan oligomers.....	24
8 Relationship between $\frac{1}{\text{no. of mer}}$ and HOMO-LUMO energy differences for determining the energy gap	28
9 The schematic of chitoan tetramer with the different amount of water.....	29
10 The schematic of proton transfer in chitosan monomer with 10 % water content	32
11 Chitosan dimer with 10 % water content	28
12 Chitosan trimer with 10% water content	29
13 Chitosan tetramer with 10% water content	30
14 Chitosan pentamer with 10% water content	31
15 The schematic of proton transfer in chitosan monomer with 35 % water content	32
16 Chitosan dimer with 35 % water content	34
17 Chitosan trimer with 35% water content	35
18 Chitosan tetramer with 35% water content	36
19 Chitosan pentamer with 35% water content	37
20 The schematic of proton transfer in chitosan monomer with 90 % water content	38
21 Chitosan dimer with 90 % water content	40
22 Chitosan trimer with 90% water content	41

LIST OF FIGURES (Cont'd)

Figure		Page
23	Chitosan tetramer with 90% water content	41
24	Chitosan pentamer with 90% water content	42
25	The chitosan pentamer with 35% water and released electron	43