

LIST OF FIGURES

Figure		Page
1	The structures of ethylene oxide and propylene oxide in balls and stick format	9
2	Molecular structure of Doxorubicin	39
3	Molecular structure of glucosamine(ethylene glycol)	39
4	Molecular structure of glucosamine(ethylene glycol) oligomers	39
5	Reaction of acid solution to di glucosamine(ethylene glycol)	41
6	Reaction of water solution to di glucosamine(ethylene glycol)	41
7	Reaction of base solution to di glucosamine(ethylene glycol)	41
8	Molecular structure of ethylene glycol	42
9	Molecular structure of glucosamine(ethylene glycol)	43
10	Reaction of breaking bond of glucosamine(ethylene glycol) oligomers by varying amount of ethylene glycol	43
11	Micelle formations from doxorubicin and glucosamine(ethylene glycol) 1 molecule	45
12	Micelle formations from doxorubicin and glucosamine(ethylene glycol) 2 molecules	46
13	Micelle formations from doxorubicin and glucosamine(ethylene glycol) 3 molecules	47
14	The molecular structure; (a) di chitosan-mono(ethylene glycol) (b) di chitosan-di(ethylene glycol)	48
15	Molecular structure of doxorubicin from simulation	50
16	Total energy of doxorubicin by AM1, PM3 and HF/6-31G optimization Methods	51
17	Charge in doxorubicin molecule by AM1	54
18	Charge in doxorubicin molecule by PM3	55
19	Charge in doxorubicin molecule by HF/6-31G	55
20	Molecular structure of glucosamine(ethylene glycol) from simulation	57
21	Total energy of glucosamine(ethylene glycol) by AM1, PM3 and HF/6-31G optimization methods	58

LIST OF FIGURES (continued)

Figure		Page
22	Charge in glucosamine(ethylene glycol) molecule from optimization by AM1	60
23	Charge in glucosamine(ethylene glycol) molecule from optimization by PM3	61
24	Charge in glucosamine(ethylene glycol) molecule from optimization by HF/6-31G	61
25	Reaction mechanism of di glucosamine(ethylene glycol) in acid condition	63
26	Relative energy curve of reaction mechanism of di glucosamine (ethylene glycol) in acid condition contain four steps in molecular structure	65
27	Reaction mechanism of di glucosamine(ethylene glycol) in normal condition	67
28	Relative energy curve of reaction mechanism of glucosamine (ethylene glycol) in normal condition contain four steps in molecular structure	69
29	Reaction mechanism of di glucosamine(ethylene glycol) in base condition; breaking at polymer bond of glucosamine(ethylene glycol) monomer	71
30	Relative energy curve of reaction mechanism of di glucosamine (ethylene glycol) in base condition containing four steps in molecular structure	73
31	Reaction mechanism of di glucosamine(ethylene glycol) in normal condition; reaction with ethylene glycol	75
32	Relative energy curve of reaction mechanism of di glucosamine (ethylene glycol) in base condition containing four steps in molecular structure	77
33	Structure of poly(ethylene glycol) in glucosamine molecule	79
34	Relative molecular energy of glucosamine(ethylene glycol) relate with ethylene glycol group	80
35	Position of doxorubicin to micelle formation by H-bond with glucosamine(ethylene glycol) by semi-empirical PM3 method	81
36	Position of glucosamine(ethylene glycol) to micelle formation by H-bond with glucosamine(ethylene glycol) by semi-empirical PM3 method	82

LIST OF FIGURES (continued)

Figure		Page
37	Molecular structure of glucosamine(ethylene glycol)	83
38	Relationship between relative energy of micelle formation and amount of glucosamine(ethylene glycol)	84
39	Micelle formation from simulation by B3LYP/6-31G//PM3 method	85
40	The relative energy of acid interaction; di glucosamine-mono(ethylene glycol), di glucosamine-di(ethylene glycol), and di glucosamine-tri(ethylene glycol)	91
41	The relative energy of water interaction; di glucosamine-mono(ethylene glycol) and di glucosamine-di(ethylene glycol) in normal solution	92
42	The relative energy of hydroxide ion interaction; di glucosamine-mono(ethylene glycol) glucosamine and di glucosamine-di(ethylene glycol)glucosamine in normal solution	93