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附錄一、原始數據

實驗毒物: Ethyl fluoroacetate　　初始細胞密度(cells/mL) : 15000

MCV (μm3) : 43.7　　Initial pH : 7.48　　EDTA(%):0

T(°C) :24　　Test duration :48-h

Conc mg/L	Initial DO mg/L	Final DO mg/L	Final cells cells/ml	Delta DO mg/L	μspecific	μrelative	IR (growth rate)	IR (Biomass)	IR (DO)
Control	1.40	8.04	396400	6.64	1.64	1.00	0.00	0.00	0.00
0.1520	1.45	2.95	64900	1.50	0.73	0.45	0.55	0.87	0.77
0.0760	1.48	3.68	88100	2.20	0.89	0.54	0.46	0.81	0.67
0.0380	1.58	4.47	107100	2.89	0.98	0.60	0.40	0.76	0.56
0.0190	1.60	5.30	139700	3.70	1.12	0.68	0.32	0.67	0.44
0.0095	1.77	6.24	187900	4.47	1.26	0.77	0.23	0.55	0.33
0.0048	1.52	5.69	172000	4.17	1.22	0.75	0.25	0.59	0.37
Control	1.29	7.90	371500	6.61	1.60	1.00	0.00	0.00	0.00
0.1520	1.40	2.88	55100	1.48	0.65	0.41	0.59	0.89	0.78
0.0760	1.55	3.19	57000	1.64	0.67	0.42	0.58	0.88	0.75
0.0380	1.49	4.11	85700	2.62	0.87	0.54	0.46	0.80	0.60
0.0190	1.48	5.18	146100	3.70	1.14	0.71	0.29	0.63	0.44
0.0095	1.92	6.44	176700	4.52	1.23	0.77	0.23	0.55	0.32
0.0048	1.57	5.99	203000	4.42	1.30	0.81	0.19	0.47	0.33
Control	1.33	7.40	373700	6.07	1.61	1.00	0.00	0.00	0.00
0.1520	1.37	3.31	60500	1.94	0.70	0.43	0.57	0.87	0.68
0.0760	1.50	3.60	75700	2.10	0.81	0.50	0.50	0.83	0.65
0.0380	1.56	4.29	106500	2.73	0.98	0.61	0.39	0.74	0.55
0.0190	1.61	5.09	135000	3.48	1.10	0.68	0.32	0.67	0.43
0.0095	2.05	6.29	176600	4.24	1.23	0.77	0.23	0.55	0.30
0.0048	1.71	6.26	210100	4.55	1.32	0.82	0.18	0.46	0.25
Control	1.34	7.78	380533	6.44	1.62	1.00	0.00	0.00	0.00
0.1520	1.41	3.05	60167	1.64	0.69	0.43	0.57	0.88	0.75
0.0760	1.51	3.49	73600	1.98	0.79	0.49	0.51	0.84	0.69
0.0380	1.54	4.29	99767	2.75	0.94	0.58	0.41	0.77	0.57
0.0190	1.56	5.19	140267	3.63	1.12	0.69	0.31	0.66	0.44
0.0095	1.91	6.32	180400	4.41	1.24	0.77	0.23	0.55	0.32
0.0048	1.60	5.98	195033	4.38	1.28	0.79	0.21	0.51	0.32

IR : Inhibition rate

Biomass : Yield f (Final yield based on cell density)

實驗毒物: Ethyl chloroacetate　　初始細胞密度(cells/mL) : 15000

MCV (μm3) : 41.0　　Initial pH : 7.44　　EDTA(%):0

T(°C) :24　　Test duration :48-h

Conc mg/L	Initial DO mg/L	Final DO mg/L	Final cells cells/ml	Delta DO mg/L	μspecific	μrelative	IR (growth rate)	IR (Biomass)	IR (DO)
Control	1.62	6.34	249500	4.72	1.41	1.00	0.00	0.00	0.00
0.2115	2.54	2.59	18800	0.05	0.11	0.08	0.92	0.98	0.99
0.1058	2.10	2.77	46700	0.67	0.57	0.40	0.60	0.86	0.86
0.0529	1.90	5.51	171200	3.61	1.22	0.87	0.13	0.33	0.24
0.0264	1.63	5.12	166700	3.49	1.20	0.86	0.14	0.35	0.26
0.0132	1.71	6.62	253600	4.91	1.41	1.01	-0.01	-0.02	-0.04
0.0066	1.75	5.66	181600	3.91	1.25	0.89	0.11	0.29	0.17
Control	1.52	5.35	153300	3.83	1.16	1.00	0.00	0.00	0.00
0.2115	2.60	2.93	25200	0.33	0.26	0.22	0.78	0.93	0.91
0.1058	2.23	2.75	24400	0.52	0.24	0.21	0.79	0.93	0.86
0.0529	1.92	5.06	143300	3.14	1.13	0.97	0.03	0.07	0.18
0.0264	1.71	5.44	155700	3.73	1.17	1.01	-0.01	-0.02	0.03
0.0132	1.63	4.42	115300	2.79	1.02	0.88	0.12	0.27	0.27
0.0066	1.65	5.27	145500	3.62	1.14	0.98	0.02	0.06	0.05
Control	1.38	4.89	169400	3.51	1.21	1.00	0.00	0.00	0.00
0.2115	2.97	2.91	22900	-0.06	0.21	0.17	0.83	0.95	1.02
0.1058	2.39	3.30	29500	0.91	0.34	0.28	0.72	0.91	0.74
0.0529	2.22	5.76	166200	3.54	1.20	0.99	0.01	0.02	-0.01
0.0264	1.78	5.81	179100	4.03	1.24	1.02	-0.02	-0.06	-0.15
0.0132	1.74	4.20	109500	2.46	0.99	0.82	0.18	0.39	0.30
0.0066	1.62	5.31	159500	3.69	1.18	0.98	0.02	0.06	-0.05
Control	1.51	5.53	190733	4.02	1.26	1.00	0.00	0.00	0.00
0.2115	2.70	2.81	22300	0.11	0.19	0.16	0.84	0.96	0.97
0.1058	2.24	2.94	33533	0.70	0.38	0.30	0.68	0.89	0.83
0.0529	2.01	5.44	160233	3.43	1.18	0.94	0.07	0.17	0.15
0.0264	1.71	5.46	167167	3.75	1.20	0.96	0.05	0.13	0.07
0.0132	1.69	5.08	159467	3.39	1.14	0.90	0.07	0.18	0.16
0.0066	1.67	5.41	162200	3.74	1.19	0.95	0.06	0.16	0.07

IR : Inhibition rate

Biomass : Yield f (Final yield based on cell density)

實驗毒物: Ethyl bromoacetate　　初始細胞密度(cells/mL) : 15000

MCV (μm3) : 39.8　　Initial pH : 7.43　　EDTA(%):0

T(°C) :24　　Test duration :48-h

Conc mg/L	Initial DO mg/L	Final DO mg/L	Final cells cells/ml	Delta DO mg/L	μspecific	μrelative	IR (growth rate)	IR (Biomass)	IR (DO)
Control	1.38	5.99	225500	4.61	1.36	1.00	0.00	0.00	0.00
0.0580	1.74	1.72	29400	-0.02	0.34	0.25	0.75	0.93	1.00
0.0290	1.59	1.75	18600	0.16	0.11	0.08	0.92	0.98	0.97
0.0145	1.40	1.69	27900	0.29	0.31	0.23	0.77	0.94	0.94
0.0073	1.37	2.84	43200	1.47	0.53	0.39	0.61	0.87	0.68
0.0036	1.49	4.57	134900	3.08	1.10	0.81	0.19	0.43	0.33
0.0018	1.44	5.79	24400	4.35	0.24	0.18	0.82	0.96	0.06
0.0009	1.46	5.78	226500	4.32	1.36	1.00	0.00	0.00	0.06
Control	1.36	6.24	223600	4.88	1.35	1.00	0.00	0.00	0.00
0.0580	1.57	1.92	20100	0.35	0.15	0.11	0.89	0.98	0.93
0.0290	1.61	1.80	24000	0.19	0.24	0.17	0.83	0.96	0.96
0.0145	1.50	1.85	25800	0.35	0.27	0.20	0.80	0.95	0.93
0.0073	1.44	2.10	37100	0.66	0.45	0.34	0.66	0.89	0.86
0.0036	1.40	4.96	149600	3.56	1.15	0.85	0.15	0.35	0.27
0.0018	1.38	6.05	237200	4.67	1.38	1.02	-0.02	-0.07	0.04
0.0009	1.29	5.62	196900	4.33	1.29	0.95	0.05	0.13	0.11
Control	1.31	6.28	229700	4.97	1.36	1.00	0.00	0.00	0.00
0.0580	1.58	1.96	21300	0.38	0.18	0.13	0.87	0.97	0.92
0.0290	1.54	2.07	29500	0.53	0.34	0.25	0.75	0.93	0.89
0.0145	1.40	2.18	31200	0.78	0.37	0.27	0.73	0.92	0.84
0.0073	1.40	2.53	41800	1.13	0.51	0.38	0.62	0.88	0.77
0.0036	1.54	5.80	107300	4.26	0.98	0.72	0.28	0.57	0.14
0.0018	1.47	6.25	224400	4.78	1.35	0.99	0.01	0.02	0.04
0.0009	1.34	5.74	194500	4.40	1.28	0.94	0.06	0.16	0.11
Control	1.35	6.17	226267	4.82	1.36	1.00	0.00	0.00	0.00
0.0580	1.63	1.87	23600	0.24	0.22	0.16	0.83	0.96	0.95
0.0290	1.58	1.87	24033	0.29	0.23	0.17	0.83	0.96	0.94
0.0145	1.43	1.91	28300	0.47	0.32	0.23	0.77	0.94	0.90
0.0073	1.40	2.49	40700	1.09	0.50	0.37	0.63	0.88	0.77
0.0036	1.48	5.11	130600	3.63	1.08	0.79	0.20	0.45	0.25
0.0018	1.43	6.03	162000	4.60	0.99	0.73	0.12	0.30	0.05

IR : Inhibition rate

Biomass : Yield f (Final yield based on cell density)

實驗毒物: Ethyl iodoacetate　　初始細胞密度(cells/mL) : 15000

MCV (μm3) : 42.7　　Initial pH : 7.55　　EDTA(%):0

T(°C) :24　　Test duration :48-h

Conc mg/L	Initial DO mg/L	Final DO mg/L	Final cells cells/ml	Delta DO mg/L	μspecific	μrelative	IR (growth rate)	IR (Biomass)	IR (DO)
Control	1.80	5.07	200200	3.27	1.30	1.00	0.00	0.00	0.00
0.016	1.54	1.65	33600	0.11	0.40	0.31	0.69	0.90	0.97
0.008	1.41	2.12	45000	0.71	0.55	0.42	0.58	0.84	0.78
0.004	1.53	2.40	48800	0.87	0.59	0.46	0.54	0.82	0.73
0.002	1.47	3.77	134400	2.30	1.10	0.85	0.15	0.36	0.30
0.001	1.56	4.26	166600	2.70	1.20	0.93	0.07	0.18	0.17
0.0005	1.54	4.56	181100	3.02	1.25	0.96	0.04	0.10	0.08
Control	1.62	4.60	173300	2.98	1.22	1.00	0.00	0.00	0.00
0.016	1.53	2.23	40600	0.70	0.50	0.41	0.59	0.84	0.77
0.008	1.47	2.09	42000	0.62	0.51	0.42	0.58	0.83	0.79
0.004	1.54	2.43	34400	0.89	0.42	0.34	0.66	0.88	0.70
0.002	1.53	3.98	116600	2.45	1.03	0.84	0.16	0.36	0.18
0.001	1.55	4.43	178900	2.88	1.24	1.01	-0.01	-0.04	0.03
0.0005	1.54	4.71	199600	3.17	1.29	1.06	-0.06	-0.17	-0.06
Control	1.57	4.71	181900	3.14	1.25	1.00	0.00	0.00	0.00
0.0160	1.72	1.96	25900	0.24	0.27	0.22	0.78	0.93	0.92
0.0080	1.54	1.99	22600	0.45	0.20	0.16	0.84	0.95	0.86
0.0040	1.45	2.32	30400	0.87	0.35	0.28	0.72	0.91	0.72
0.0020	1.69	3.94	131100	2.25	1.08	0.87	0.13	0.30	0.28
0.0010	1.55	4.07	155500	2.52	1.17	0.94	0.06	0.16	0.20
0.0005	1.58	4.85	189500	3.27	1.27	1.02	-0.02	-0.05	-0.04
Control	1.66	4.79	185133	3.13	1.26	1.00	0.00	0.00	0.00
0.016	1.60	1.95	33367	0.35	0.39	0.31	0.68	0.89	0.89
0.008	1.47	2.07	36533	0.59	0.42	0.34	0.65	0.87	0.81
0.004	1.51	2.38	37867	0.88	0.45	0.36	0.63	0.87	0.72
0.002	1.56	3.90	127367	2.33	1.07	0.85	0.15	0.34	0.25
0.001	1.55	4.25	167000	2.70	1.20	0.96	0.04	0.11	0.14
0.0005	1.55	4.71	190067	3.15	1.27	1.01	-0.01	-0.03	-0.01

IR : Inhibition rate

Biomass : Yield f (Final yield based on cell density)

實驗毒物: Methyl bromoacetate　　初始細胞密度(cells/mL) : 15000

MCV (μm3) : 41.0　　Initial pH : 7.62　　EDTA(%):0

T(°C) :24　　Test duration :48-h

Conc mg/L	Initial DO mg/L	Final DO mg/L	Final cells cells/ml	Delta DO mg/L	μspecific	μrelative	IR (growth rate)	IR (Biomass)	IR (DO)
Control	1.42	6.95	305700	5.53	1.51	1.00	0.00	0.00	0.00
0.0420	1.74	2.04	20500	0.30	0.16	0.10	0.90	0.98	0.95
0.0210	1.54	2.16	25100	0.62	0.26	0.17	0.83	0.97	0.89
0.0105	1.46	2.25	35500	0.79	0.43	0.29	0.71	0.93	0.86
0.0053	1.40	5.07	188900	3.67	1.27	0.84	0.16	0.40	0.34
0.0026	1.38	6.69	284400	5.31	1.47	0.98	0.02	0.07	0.04
0.0013	1.56	6.77	298900	5.21	1.50	0.99	0.01	0.02	0.06
Control	1.40	6.70	312100	5.30	1.52	1.00	0.00	0.00	0.00
0.0420	1.62	2.34	15000	0.72	0.00	0.00	1.00	1.00	0.86
0.0210	1.60	2.23	21700	0.63	0.18	0.12	0.88	0.98	0.88
0.0105	1.50	2.29	31700	0.79	0.37	0.25	0.75	0.94	0.85
0.0053	1.28	4.54	188500	3.26	1.27	0.83	0.17	0.42	0.38
0.0026	2.15	6.93	293600	4.78	1.49	0.98	0.02	0.06	0.10
0.0013	1.89	6.87	295400	4.98	1.49	0.98	0.02	0.06	0.06
Control	1.40	6.98	313000	5.58	1.52	1.00	0.00	0.00	0.00
0.0420	1.68	2.43	33000	0.75	0.39	0.26	0.74	0.94	0.87
0.0210	1.69	2.12	24000	0.43	0.24	0.15	0.85	0.97	0.92
0.0105	1.56	2.01	36800	0.45	0.45	0.30	0.70	0.93	0.92
0.0053	1.37	4.98	184100	3.61	1.25	0.83	0.17	0.43	0.35
0.0026	1.45	6.70	289500	5.25	1.48	0.97	0.03	0.08	0.06
0.0013	1.73	7.01	291800	5.28	1.48	0.98	0.02	0.07	0.05
Control	1.41	6.88	310267	5.47	1.51	1.00	0.00	0.00	0.00
0.0420	1.68	2.27	22833	0.59	0.18	0.12	0.86	0.97	0.89
0.0210	1.61	2.17	23600	0.56	0.23	0.15	0.85	0.97	0.90
0.0105	1.51	2.18	34667	0.68	0.42	0.28	0.72	0.93	0.88
0.0053	1.35	4.86	187167	3.51	1.26	0.83	0.17	0.42	0.36
0.0026	1.66	6.77	289167	5.11	1.48	0.98	0.02	0.07	0.07
0.0013	1.73	6.88	295367	5.16	1.49	0.98	0.02	0.05	0.06

IR : Inhibition rate

Biomass : Yield f (Final yield based on cell density)

實驗毒物: Methyl 3-bromopropionate　　初始細胞密度(cells/mL) : 15000

MCV (μm3) : 39.5　　Initial pH : 7.49　　EDTA(%):0

T(°C) :24　　Test duration :48-h

Conc mg/L	Initial DO mg/L	Final DO mg/L	Final cells cells/ml	Delta DO mg/L	μspecific	μrelative	IR (growth rate)	IR (Biomass)	IR (DO)
Control	1.43	6.83	291100	5.40	1.48	1.00	0.00	0.00	0.00
708.6	2.50	3.23	28600	0.73	0.32	0.22	0.78	0.95	0.86
354.3	1.95	1.16	20200	-0.79	0.15	0.10	0.90	0.98	1.15
177.2	1.49	1.86	31400	0.37	0.37	0.25	0.75	0.94	0.93
88.6	1.49	5.04	108400	3.55	0.99	0.67	0.33	0.66	0.34
44.3	1.38	7.27	244200	5.89	1.39	0.94	0.06	0.17	-0.09
22.1	1.30	7.31	299000	6.01	1.50	1.01	-0.01	-0.03	-0.11
11.1	1.25	7.74	313700	6.49	1.52	1.03	-0.03	-0.08	-0.20
Control	1.26	7.66	312800	6.40	1.52	1.00	0.00	0.00	0.00
708.6	2.47	2.72	17300	0.25	0.07	0.05	0.95	0.99	0.96
354.3	1.96	0.80	20500	-1.16	0.16	0.10	0.90	0.98	1.18
177.2	1.51	2.02	29800	0.51	0.34	0.23	0.77	0.95	0.92
88.6	1.50	5.37	121100	3.87	1.04	0.69	0.31	0.64	0.40
44.3	1.43	6.97	239400	5.54	1.39	0.91	0.09	0.25	0.13
22.1	1.42	6.81	278500	5.39	1.46	0.96	0.04	0.12	0.16
11.1	1.42	6.78	269800	5.36	1.44	0.95	0.05	0.14	0.16
Control	1.22	6.86	307700	5.64	1.51	1.00	0.00	0.00	0.00
708.6	2.37	2.98	15800	0.61	0.03	0.02	0.98	1.00	0.89
354.3	2.01	1.76	24300	-0.25	0.24	0.16	0.84	0.97	1.04
177.2	1.45	2.02	33100	0.57	0.40	0.26	0.74	0.94	0.90
88.6	1.59	5.39	101100	3.80	0.95	0.63	0.37	0.71	0.33
44.3	1.44	6.63	249200	5.19	1.41	0.93	0.07	0.20	0.08
22.1	1.41	7.10	279500	5.69	1.46	0.97	0.03	0.10	-0.01
11.1	1.34	6.94	295400	5.60	1.49	0.99	0.01	0.04	0.01
Control	1.30	7.12	303867	5.81	1.50	1.00	0.00	0.00	0.00
708.6	2.45	2.98	20567	0.53	0.14	0.09	0.90	0.98	0.91
354.3	1.97	1.24	21667	-0.73	0.18	0.12	0.88	0.98	1.13
177.2	1.48	1.97	31433	0.48	0.37	0.25	0.75	0.94	0.92
88.6	1.53	5.27	110200	3.74	1.00	0.66	0.34	0.67	0.36
44.3	1.42	6.96	244267	5.54	1.40	0.93	0.07	0.21	0.05
22.1	1.38	7.07	285667	5.70	1.47	0.98	0.02	0.06	0.02
11.1	1.34	7.15	292967	5.82	1.49	0.99	0.01	0.04	0.00

IR : Inhibition rate　　Biomass : Yield f (Final yield based on cell density)

實驗毒物: Methyl 2-bromopropionate　　初始細胞密度(cells/mL) : 15000

MCV (μm3) : 42.4　　Initial pH : 7.60　　EDTA(%):0

T(°C) :24　　Test duration :48-h

Conc mg/L	Initial DO mg/L	Final DO mg/L	Final cells cells/ml	Delta DO mg/L	μspecific	μrelative	IR (growth rate)	IR (Biomass)	IR (DO)
Control	1.33	5.32	205200	3.99	1.31	1.00	0.00	0.00	0.00
0.927	1.52	2.92	59700	1.40	0.69	0.53	0.47	0.76	0.65
0.463	1.62	3.81	100100	2.19	0.95	0.73	0.27	0.55	0.45
0.232	1.38	4.18	124600	2.80	1.06	0.81	0.19	0.42	0.30
0.116	1.37	4.74	169300	3.37	1.21	0.93	0.07	0.19	0.16
0.058	1.64	5.65	229600	4.01	1.36	1.04	-0.04	-0.13	-0.01
0.029	1.36	4.95	228000	3.59	1.36	1.04	-0.04	-0.12	0.10
0.014	1.45	5.41	233400	3.96	1.37	1.05	-0.05	-0.15	0.01
Control	1.36	5.17	227600	3.81	1.36	1.00	0.00	0.00	0.00
0.9267	1.57	3.51	79600	1.94	0.83	0.61	0.39	0.70	0.49
0.4634	1.61	4.17	116500	2.56	1.02	0.75	0.25	0.52	0.33
0.2317	1.50	4.57	147400	3.07	1.14	0.84	0.16	0.38	0.19
0.1158	1.53	5.21	209400	3.68	1.32	0.97	0.03	0.09	0.03
0.0579	1.49	4.40	188400	2.91	1.27	0.93	0.07	0.18	0.24
0.0290	1.38	4.75	204600	3.37	1.31	0.96	0.04	0.11	0.12
0.0145	1.45	5.17	239300	3.72	1.38	1.02	-0.02	-0.06	0.02
Control	1.54	5.21	212700	3.67	1.33	1.00	0.00	0.00	0.00
0.9267	1.31	3.01	66800	1.70	0.75	0.56	0.44	0.74	0.54
0.4634	1.46	3.76	100900	2.30	0.95	0.72	0.28	0.57	0.37
0.2317	1.63	4.79	153400	3.16	1.16	0.88	0.12	0.30	0.14
0.1158	1.51	3.89	140200	2.38	1.12	0.84	0.16	0.37	0.35
0.0579	1.56	4.28	143400	2.72	1.13	0.85	0.15	0.35	0.26
0.0290	1.41	5.43	235100	4.02	1.38	1.04	-0.04	-0.11	-0.10
0.0145	1.34	4.67	209900	3.33	1.32	1.00	0.00	0.01	0.09
Control	1.41	5.23	215167	3.82	1.33	1.00	0.00	0.00	0.00
0.9267	1.47	3.15	68700	1.68	0.76	0.57	0.43	0.73	0.56
0.4634	1.56	3.91	105833	2.35	0.98	0.73	0.27	0.55	0.39
0.2317	1.50	4.51	141800	3.01	1.12	0.84	0.16	0.37	0.21
0.1158	1.47	4.61	172967	3.14	1.22	0.91	0.08	0.21	0.18
0.0579	1.56	4.78	187133	3.21	1.25	0.94	0.05	0.14	0.16
0.0290	1.38	5.04	222567	3.66	1.35	1.01	-0.01	-0.04	0.04
0.0145	1.41	5.08	227533	3.67	1.36	1.02	-0.02	-0.06	0.04

IR : Inhibition rate　　Biomass : Yield f (Final yield based on cell density)

實驗毒物: Ethyl-2-bromopropionate　　初始細胞密度(cells/mL) : 15000

MCV (μm3) : 44.2　　Initial pH : 7.40　　EDTA(%):0

T(°C) :24　　Test duration :48-h

Conc mg/L	Initial DO mg/L	Final DO mg/L	Final cells cells/ml	Delta DO mg/L	μspecific	μrelative	IR (growth rate)	IR (Biomass)	IR (DO)
Control	1.29	5.69	271000	4.40	1.45	1.00	0.00	0.00	0.00
4.480	1.54	1.74	30700	0.20	0.36	0.25	0.75	0.94	0.95
2.240	1.23	1.42	24000	0.19	0.24	0.16	0.84	0.96	0.96
1.120	1.31	2.17	40100	0.86	0.49	0.34	0.66	0.90	0.80
0.560	1.12	3.08	57200	1.96	0.67	0.46	0.54	0.84	0.55
0.280	1.38	4.06	124600	2.68	1.06	0.73	0.27	0.57	0.39
0.140	1.20	5.25	229500	4.05	1.36	0.94	0.06	0.16	0.08
0.070	1.26	5.70	288200	4.44	1.48	1.02	-0.02	-0.07	-0.01
Control	1.31	6.01	276600	4.70	1.46	1.00	0.00	0.00	0.00
4.480	1.62	1.93	35700	0.31	0.43	0.30	0.70	0.92	0.93
2.240	1.23	1.71	21100	0.48	0.17	0.12	0.88	0.98	0.90
1.120	1.19	2.40	39300	1.21	0.48	0.33	0.67	0.91	0.74
0.560	1.15	2.75	54800	1.60	0.65	0.44	0.56	0.85	0.66
0.280	1.26	3.99	113200	2.73	1.01	0.69	0.31	0.62	0.42
0.140	1.20	5.53	248200	4.33	1.40	0.96	0.04	0.11	0.08
0.070	1.13	5.34	268700	4.21	1.44	0.99	0.01	0.03	0.10
Control	1.21	5.86	275800	4.65	1.46	1.00	0.00	0.00	0.00
4.480	1.69	2.40	32800	0.71	0.39	0.27	0.73	0.93	0.85
2.240	1.31	2.20	31200	0.89	0.37	0.25	0.75	0.94	0.81
1.120	1.28	1.74	30400	0.46	0.35	0.24	0.76	0.94	0.90
0.560	1.16	2.94	37600	1.78	0.46	0.32	0.68	0.91	0.62
0.280	1.20	3.42	81400	2.22	0.85	0.58	0.42	0.75	0.52
0.140	1.16	5.61	271700	4.45	1.45	0.99	0.01	0.02	0.04
0.070	1.32	5.75	274100	4.43	1.45	1.00	0.00	0.01	0.05
Control	1.27	5.85	274467	4.58	1.45	1.00	0.00	0.00	0.00
4.480	1.62	2.02	33067	0.41	0.39	0.27	0.73	0.93	0.91
2.240	1.26	1.78	25433	0.52	0.26	0.18	0.82	0.96	0.89
1.120	1.26	2.10	36600	0.84	0.44	0.30	0.69	0.92	0.82
0.560	1.14	2.92	49867	1.78	0.59	0.41	0.59	0.87	0.61
0.280	1.28	3.82	106400	2.54	0.97	0.67	0.33	0.65	0.45
0.140	1.19	5.46	249800	4.28	1.41	0.97	0.03	0.10	0.07
0.070	1.24	5.60	277000	4.36	1.46	1.00	0.00	-0.01	0.05

IR : Inhibition rate　　Biomass : Yield f (Final yield based on cell density)

實驗毒物: Methyl 2-bromobutyrate　　初始細胞密度(cells/mL) : 15000

MCV (μm3) : 41.3　　Initial pH : 7.55　　EDTA(%):0

T(°C) :24　　Test duration :48-h

Conc mg/L	Initial DO mg/L	Final DO mg/L	Final cells cells/ml	Delta DO mg/L	μspecific	μrelative	IR (growth rate)	IR (Biomass)	IR (DO)
Control	1.25	6.20	243200	4.95	1.39	1.00	0.00	0.00	0.00
5.990	1.79	1.69	21000	-0.10	0.17	0.12	0.88	0.97	1.02
2.995	1.46	1.85	29600	0.39	0.34	0.24	0.76	0.94	0.92
1.498	1.29	4.70	159700	3.41	1.18	0.85	0.15	0.37	0.31
0.749	1.32	5.85	221800	4.53	1.35	0.97	0.03	0.09	0.08
0.374	1.40	6.15	239700	4.75	1.39	0.99	0.01	0.02	0.04
0.187	1.42	6.31	251100	4.89	1.41	1.01	-0.01	-0.03	0.01
0.094	1.35	6.20	240900	4.85	1.39	1.00	0.00	0.01	0.02
Control	1.19	5.97	241500	4.78	1.39	1.00	0.00	0.00	0.00
5.990	1.88	1.96	22100	0.08	0.19	0.14	0.86	0.97	0.98
2.995	1.56	1.88	31200	0.32	0.37	0.26	0.74	0.93	0.93
1.498	1.30	4.63	159700	3.33	1.18	0.85	0.15	0.36	0.30
0.749	1.33	5.80	233800	4.47	1.37	0.99	0.01	0.03	0.06
0.374	1.31	5.78	242200	4.47	1.39	1.00	0.00	0.00	0.06
0.187	1.42	5.93	251700	4.51	1.41	1.01	-0.01	-0.05	0.06
0.094	1.34	6.34	244700	5.00	1.40	1.00	0.00	-0.01	-0.05
Control	1.12	6.67	258700	5.55	1.42	1.00	0.00	0.00	0.00
5.990	2.12	2.17	25500	0.05	0.27	0.19	0.81	0.96	0.99
2.995	1.52	1.83	20300	0.31	0.15	0.11	0.89	0.98	0.94
1.498	1.24	4.59	126800	3.35	1.07	0.75	0.25	0.54	0.40
0.749	1.33	5.70	230100	4.37	1.37	0.96	0.04	0.12	0.21
0.374	1.25	5.86	251100	4.61	1.41	0.99	0.01	0.03	0.17
0.187	1.38	6.55	252200	5.17	1.41	0.99	0.01	0.03	0.07
0.094	1.44	6.45	234900	5.01	1.38	0.97	0.03	0.10	0.10
Control	1.19	6.28	247800	5.09	1.40	1.00	0.00	0.00	0.00
5.990	1.93	1.94	22867	0.01	0.21	0.15	0.85	0.97	1.00
2.995	1.51	1.85	27033	0.34	0.29	0.20	0.79	0.95	0.93
1.498	1.28	4.64	148733	3.36	1.14	0.82	0.18	0.43	0.34
0.749	1.33	5.78	228567	4.46	1.36	0.97	0.03	0.08	0.13
0.374	1.32	5.93	244333	4.61	1.40	1.00	0.01	0.01	0.09
0.187	1.41	6.26	251667	4.86	1.41	1.01	-0.01	-0.02	0.05
0.094	1.38	6.33	240167	4.95	1.39	0.99	0.01	0.03	0.03

IR : Inhibition rate　　Biomass : Yield f (Final yield based on cell density)

實驗毒物: Ethyl-2-di-bromoisobutyrate　　初始細胞密度(cells/mL) : 15000

MCV (μm3) : 40.8　　Initial pH : 7.58　　EDTA(%):0

T(°C) :24　　Test duration :48-h

Conc mg/L	Initial DO mg/L	Final DO mg/L	Final cells cells/ml	Delta DO mg/L	μspecific	μrelative	IR (growth rate)	IR (Biomass)	IR (DO)
Control	1.25	8.28	287600	7.03	1.48	1.00	0.00	0.00	0.00
104.0	2.59	2.32	21900	-0.27	0.19	0.13	0.87	0.97	1.04
52.0	1.92	1.69	29900	-0.23	0.34	0.23	0.77	0.95	1.03
26.0	1.69	2.76	164000	1.07	1.20	0.81	0.19	0.45	0.85
13.0	1.44	5.50	234000	4.06	1.37	0.93	0.07	0.20	0.42
6.5	1.37	6.60	249300	5.23	1.41	0.95	0.05	0.14	0.26
3.3	1.40	6.59	272100	5.19	1.45	0.98	0.02	0.06	0.26
1.6	1.27	7.54	305000	6.27	1.51	1.02	-0.02	-0.06	0.11
Control	1.25	7.70	285900	6.45	1.47	1.00	0.00	0.00	0.00
104.0	2.38	2.21	20200	-0.17	0.15	0.10	0.90	0.98	1.03
52.0	1.93	2.01	28700	0.08	0.32	0.22	0.78	0.95	0.99
26.0	1.61	2.58	91700	0.97	0.91	0.61	0.39	0.72	0.85
13.0	1.51	5.36	222600	3.85	1.35	0.92	0.08	0.23	0.40
6.5	1.31	6.45	259300	5.14	1.42	0.97	0.03	0.10	0.20
3.3	1.36	6.72	276300	5.36	1.46	0.99	0.01	0.04	0.17
1.6	1.27	7.40	291500	6.13	1.48	1.01	-0.01	-0.02	0.05
Control	1.31	6.97	274400	5.66	1.45	1.00	0.00	0.00	0.00
104.0	2.44	2.40	25300	-0.04	0.26	0.18	0.82	0.96	1.01
52.0	1.89	2.66	31200	0.77	0.37	0.25	0.75	0.94	0.86
26.0	1.61	3.13	80200	1.52	0.84	0.58	0.42	0.75	0.73
13.0	1.49	5.71	250300	4.22	1.41	0.97	0.03	0.09	0.25
6.5	1.45	6.68	268000	5.23	1.44	0.99	0.01	0.02	0.08
3.3	1.33	7.52	259100	6.19	1.42	0.98	0.02	0.06	-0.09
1.6	1.24	7.57	285800	6.33	1.47	1.01	-0.01	-0.04	-0.12
Control	1.27	7.65	282633	6.38	1.47	1.00	0.00	0.00	0.00
104.0	2.47	2.31	22467	-0.16	0.20	0.14	0.86	0.97	1.03
52.0	1.91	2.12	29933	0.21	0.35	0.24	0.76	0.94	0.97
26.0	1.64	2.82	111967	1.19	0.98	0.67	0.32	0.64	0.81
13.0	1.48	5.52	235633	4.04	1.38	0.94	0.06	0.18	0.37
6.5	1.38	6.58	258867	5.20	1.42	0.97	0.03	0.09	0.18
3.3	1.36	6.94	269167	5.58	1.44	0.98	0.02	0.05	0.13
1.6	1.26	7.50	294100	6.24	1.49	1.01	-0.01	-0.04	0.02

IR : Inhibition rate　　Biomass : Yield f (Final yield based on cell density)

實驗毒物: tert-Butyl bromoacetate　　初始細胞密度(cells/mL) : 15000

MCV (μm3) : 43.2　　Initial pH : 7.46　　EDTA(%):0

T(°C) :24　　Test duration :48-h

Conc mg/L	Initial DO mg/L	Final DO mg/L	Final cells cells/ml	Delta DO mg/L	μspecific	μrelative	IR (growth rate)	IR (Biomass)	IR (DO)
Control	1.28	8.26	369700	6.98	1.60	1.00	0.00	0.00	0.00
0.1050	2.39	3.45	28700	1.06	0.32	0.20	0.80	0.96	0.85
0.0525	1.57	2.52	21500	0.95	0.18	0.11	0.89	0.98	0.86
0.0263	1.37	3.37	58400	2.00	0.68	0.42	0.58	0.88	0.71
0.0131	1.19	6.36	264000	5.17	1.43	0.89	0.11	0.30	0.26
0.0066	1.35	7.31	301000	5.96	1.50	0.94	0.06	0.19	0.15
0.0033	1.44	8.56	384800	7.12	1.62	1.01	-0.01	-0.04	-0.02
0.0016	1.37	8.33	376500	6.96	1.61	1.01	-0.01	-0.02	0.00
Control	1.49	8.42	339800	6.93	1.56	1.00	0.00	0.00	0.00
0.1050	2.19	2.67	20700	0.48	0.16	0.10	0.90	0.98	0.93
0.0525	1.63	2.80	43900	1.17	0.54	0.34	0.66	0.91	0.83
0.0263	1.30	3.68	68700	2.38	0.76	0.49	0.51	0.83	0.66
0.0131	1.29	6.76	284500	5.47	1.47	0.94	0.06	0.17	0.21
0.0066	1.25	7.12	321600	5.87	1.53	0.98	0.02	0.06	0.15
0.0033	1.44	8.72	389500	7.28	1.63	1.04	-0.04	-0.15	-0.05
0.0016	1.31	8.21	332400	6.90	1.55	0.99	0.01	0.02	0.00
Control	1.28	8.50	375800	7.22	1.61	1.00	0.00	0.00	0.00
0.1050	2.35	3.01	17400	0.66	0.07	0.05	0.95	0.99	0.91
0.0525	1.73	2.18	31100	0.45	0.36	0.23	0.77	0.96	0.94
0.0263	1.27	3.64	85100	2.37	0.87	0.54	0.46	0.81	0.67
0.0131	1.29	6.78	292700	5.49	1.49	0.92	0.08	0.23	0.24
0.0066	1.28	7.67	304900	6.39	1.51	0.94	0.06	0.20	0.11
0.0033	1.35	8.58	388000	7.23	1.63	1.01	-0.01	-0.03	0.00
0.0016	1.38	8.78	335700	7.40	1.55	0.96	0.04	0.11	-0.02
Control	1.35	8.39	361767	7.04	1.59	1.00	0.00	0.00	0.00
0.1050	2.31	3.04	22267	0.73	0.19	0.12	0.88	0.98	0.90
0.0525	1.64	2.50	32167	0.86	0.36	0.23	0.76	0.95	0.88
0.0263	1.31	3.56	70733	2.25	0.77	0.48	0.51	0.84	0.68
0.0131	1.26	6.63	280400	5.38	1.46	0.92	0.08	0.23	0.24
0.0066	1.29	7.37	309167	6.07	1.51	0.95	0.05	0.15	0.14
0.0033	1.41	8.62	387433	7.21	1.63	1.02	-0.02	-0.07	-0.02
0.0016	1.35	8.44	348200	7.09	1.57	0.99	0.01	0.04	-0.01

IR : Inhibition rate　　Biomass : Yield f (Final yield based on cell density)

實驗毒物: Ethyl dibromoacetate　　初始細胞密度(cells/mL) : 15000

MCV (μm3) : 42.2　　Initial pH : 7.56　　EDTA(%):0

T(°C) :24　　Test duration :48-h

Conc mg/L	Initial DO mg/L	Final DO mg/L	Final cells cells/ml	Delta DO mg/L	μspecific	μrelative	IR (growth rate)	IR (Biomass)	IR (DO)
Control	1.55	5.67	272600	4.12	1.45	1.00	0.00	0.00	0.00
0.640	2.12	2.21	31000	0.09	0.36	0.25	0.75	0.94	0.98
0.320	1.48	1.8	28700	0.32	0.32	0.22	0.78	0.95	0.92
0.160	1.54	2.53	55900	0.99	0.66	0.45	0.55	0.84	0.76
0.080	1.28	4.55	214100	3.27	1.33	0.92	0.08	0.23	0.21
0.040	1.33	5.54	268900	4.21	1.44	1.00	0.00	0.01	-0.02
0.020	1.38	4.88	251500	3.5	1.41	0.97	0.03	0.08	0.15
0.010	1.61	5.41	273800	3.8	1.45	1.00	0.00	0.00	0.08
Control	1.26	5.66	292800	4.4	1.49	1.00	0.00	0.00	0.00
0.640	1.86	2.24	33800	0.38	0.41	0.27	0.73	0.93	0.91
0.320	1.61	1.57	25100	-0.04	0.26	0.17	0.83	0.96	1.01
0.160	1.41	2.12	53300	0.71	0.63	0.43	0.57	0.86	0.84
0.080	1.37	4.81	220500	3.44	1.34	0.90	0.10	0.26	0.22
0.040	1.35	4.56	245300	3.21	1.40	0.94	0.06	0.17	0.27
0.020	1.35	5.13	268800	3.78	1.44	0.97	0.03	0.09	0.14
0.010	1.34	5.13	302500	3.79	1.50	1.01	-0.01	-0.03	0.14
Control	1.34	5.56	291200	4.22	1.48	1.00	0.00	0.00	0.00
0.640	2.11	2.04	35600	-0.07	0.43	0.29	0.71	0.93	1.02
0.320	1.63	1.68	28400	0.05	0.32	0.22	0.78	0.95	0.99
0.160	1.45	2.71	57500	1.26	0.67	0.45	0.55	0.85	0.70
0.080	1.52	5.11	238700	3.59	1.38	0.93	0.07	0.19	0.15
0.040	1.39	5.07	255700	3.68	1.42	0.96	0.04	0.13	0.13
0.020	1.35	5.35	293000	4	1.49	1.00	0.00	-0.01	0.05
0.010	1.45	5.23	272500	3.78	1.45	0.98	0.02	0.07	0.10
Control	1.38	5.63	285533	4.25	1.47	1.00	0.00	0.00	0.00
0.640	2.03	2.16	33467	0.13	0.40	0.27	0.73	0.93	0.97
0.320	1.57	1.68	27400	0.11	0.30	0.20	0.80	0.95	0.97
0.160	1.47	2.45	55567	0.99	0.65	0.44	0.56	0.85	0.77
0.080	1.39	4.82	224433	3.43	1.35	0.92	0.08	0.23	0.19
0.040	1.36	5.06	256633	3.70	1.42	0.96	0.04	0.11	0.13
0.020	1.36	5.12	271100	3.76	1.45	0.98	0.02	0.05	0.11
0.010	1.47	5.26	282933	3.79	1.47	1.00	0.00	0.01	0.11

IR : Inhibition rate　　Biomass : Yield f (Final yield based on cell density)

實驗毒物: Ethyl tribromoacetate　　初始細胞密度(cells/mL) : 15000

MCV (μm3) : 40.5　　Initial pH : 7.47　　EDTA(%):0

T(°C) :24　　Test duration :48-h

Conc mg/L	Initial DO mg/L	Final DO mg/L	Final cells cells/ml	Delta DO mg/L	μspecific	μrelative	IR (growth rate)	IR (Biomass)	IR (DO)
Control	1.28	5.58	195700	4.3	1.28	1.00	0.00	0.00	0.00
1.280	2.89	3.05	31500	0.16	0.37	0.29	0.71	0.91	0.96
0.640	2.12	2.92	57300	0.8	0.67	0.52	0.48	0.77	0.81
0.320	1.42	2.79	81600	1.37	0.85	0.66	0.34	0.63	0.68
0.160	1.26	3.99	135100	2.73	1.10	0.86	0.14	0.34	0.37
0.080	1.28	4.75	161400	3.47	1.19	0.92	0.08	0.19	0.19
0.040	1.29	5.69	175000	4.4	1.23	0.96	0.04	0.11	-0.02
0.020	1.25	6.25	208800	5	1.32	1.03	-0.03	-0.07	-0.16
Control	1.32	5.84	189800	4.52	1.27	1.00	0.00	0.00	0.00
1.280	2.57	2.71	32000	0.14	0.38	0.30	0.70	0.90	0.97
0.640	2.07	2.82	58700	0.75	0.68	0.54	0.46	0.75	0.83
0.320	1.45	3.52	100000	2.07	0.95	0.75	0.25	0.51	0.54
0.160	1.28	3.82	114800	2.54	1.02	0.80	0.20	0.43	0.44
0.080	1.29	4.81	177900	3.52	1.24	0.97	0.03	0.07	0.22
0.040	1.24	5.92	205200	4.68	1.31	1.03	-0.03	-0.09	-0.04
0.020	1.41	6.3	210300	4.89	1.32	1.04	-0.04	-0.12	-0.08
Control	1.27	6	215200	4.73	1.33	1.00	0.00	0.00	0.00
1.280	3.17	1.36	34800	-1.81	0.42	0.32	0.68	0.90	1.38
0.640	1.89	2.71	52000	0.82	0.62	0.47	0.53	0.82	0.83
0.320	1.43	3.23	96000	1.8	0.93	0.70	0.30	0.60	0.62
0.160	1.3	3.54	133100	2.24	1.09	0.82	0.18	0.41	0.53
0.080	1.26	5.12	166200	3.86	1.20	0.90	0.10	0.24	0.18
0.040	1.29	6.22	219100	4.93	1.34	1.01	-0.01	-0.02	-0.04
0.020	1.21	5.49	193900	4.28	1.28	0.96	0.04	0.11	0.10
Control	1.29	5.81	200233	4.52	1.29	1.00	0.00	0.00	0.00
1.280	2.88	2.37	32767	-0.50	0.39	0.30	0.70	0.90	1.11
0.640	2.03	2.82	56000	0.79	0.66	0.51	0.49	0.78	0.83
0.320	1.43	3.18	92533	1.75	0.91	0.70	0.30	0.58	0.61
0.160	1.28	3.78	127667	2.50	1.07	0.83	0.17	0.39	0.45
0.080	1.28	4.89	168500	3.62	1.21	0.93	0.07	0.17	0.20
0.040	1.27	5.94	199767	4.67	1.29	1.00	0.00	0.00	-0.03
0.020	1.29	6.01	204333	4.72	1.31	1.01	-0.01	-0.02	-0.05

IR : Inhibition rate　　Biomass : Yield f (Final yield based on cell density)

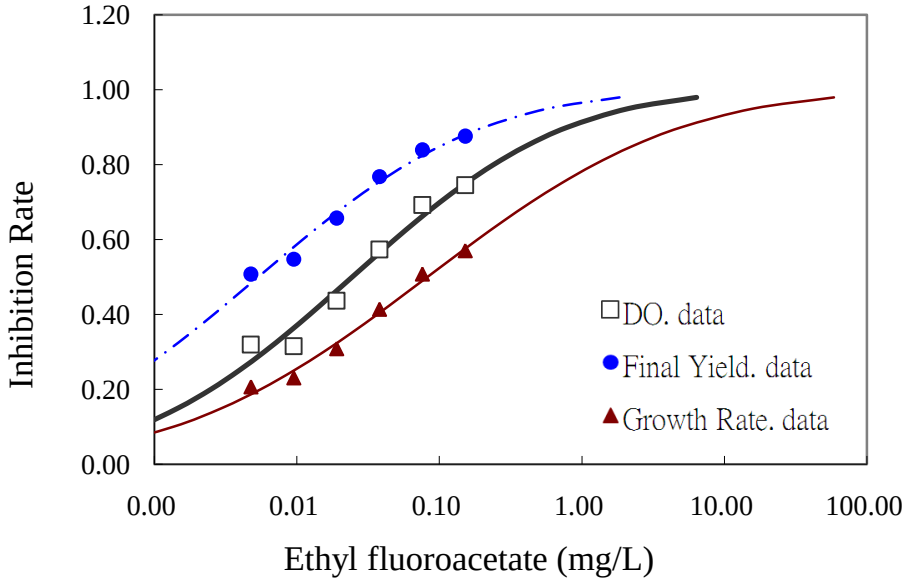
實驗毒物: Ethyl-2,3-di-bromopropionate　　初始細胞密度(cells/mL) : 15000

MCV (μm3) : 39.5　　Initial pH : 7.62　　EDTA(%):0

T(°C) :24　　Test duration :48-h

Conc mg/L	Initial DO mg/L	Final DO mg/L	Final cells cells/ml	Delta DO mg/L	μspecific	μrelative	IR (growth rate)	IR (Biomass)	IR (DO)
Control	1.85	5.75	242200	3.9	1.39	1.00	0.00	0.00	0.00
0.2340	2.09	3.41	48400	1.32	0.59	0.42	0.58	0.85	0.66
0.1170	1.71	4.12	106800	2.41	0.98	0.71	0.29	0.60	0.38
0.0585	1.4	4.21	147700	2.81	1.14	0.82	0.18	0.42	0.28
0.0293	1.79	6.27	243600	4.48	1.39	1.00	0.00	-0.01	-0.15
0.0146	1.76	5.05	223100	3.29	1.35	0.97	0.03	0.08	0.16
0.0073	1.91	5.94	241200	4.03	1.39	1.00	0.00	0.00	-0.03
0.0037	2.11	6.06	240500	3.95	1.39	1.00	0.00	0.01	-0.01
Control	1.75	5.69	237900	3.94	1.38	1.00	0.00	0.00	0.00
0.2340	2.62	3.92	48100	1.3	0.58	0.42	0.58	0.85	0.67
0.1170	1.67	4.82	126600	3.15	1.07	0.77	0.23	0.50	0.20
0.0585	1.43	4.74	185000	3.31	1.26	0.91	0.09	0.24	0.16
0.0293	1.52	5.2	213000	3.68	1.33	0.96	0.04	0.11	0.07
0.0146	1.79	5.68	226600	3.89	1.36	0.98	0.02	0.05	0.01
0.0073	2	6.23	234400	4.23	1.37	0.99	0.01	0.02	-0.07
0.0037	2.12	6.19	232100	4.07	1.37	0.99	0.01	0.03	-0.03
Control	1.59	5.78	234900	4.19	1.38	1.00	0.00	0.00	0.00
0.2340	2.44	3.68	51300	1.24	0.61	0.45	0.55	0.83	0.70
0.1170	1.75	4.48	101200	2.73	0.95	0.69	0.31	0.61	0.35
0.0585	1.45	4.93	185300	3.48	1.26	0.91	0.09	0.23	0.17
0.0293	1.45	5.44	223800	3.99	1.35	0.98	0.02	0.05	0.05
0.0146	1.68	5.62	236000	3.94	1.38	1.00	0.00	-0.01	0.06
0.0073	1.8	5.69	230900	3.89	1.37	0.99	0.01	0.02	0.07
0.0037	1.91	5.92	245000	4.01	1.40	1.02	-0.02	-0.05	0.04
Control	1.73	5.74	238333	4.01	1.38	1.00	0.00	0.00	0.00
0.2340	2.38	3.67	49267	1.29	0.59	0.43	0.57	0.85	0.68
0.1170	1.71	4.47	111533	2.76	1.00	0.72	0.27	0.57	0.31
0.0585	1.43	4.63	172667	3.20	1.22	0.88	0.12	0.29	0.20
0.0293	1.59	5.64	226800	4.05	1.36	0.98	0.02	0.05	-0.01
0.0146	1.74	5.45	228567	3.71	1.36	0.98	0.02	0.04	0.08
0.0073	1.90	5.95	235500	4.05	1.38	1.00	0.00	0.01	-0.01
0.0037	2.05	6.06	239200	4.01	1.38	1.00	0.00	0.00	0.00

IR : Inhibition rate　　Biomass : Yield f (Final yield based on cell density)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Inhibition Rate
DO. data
Final Yield. data
Growth Rate. data
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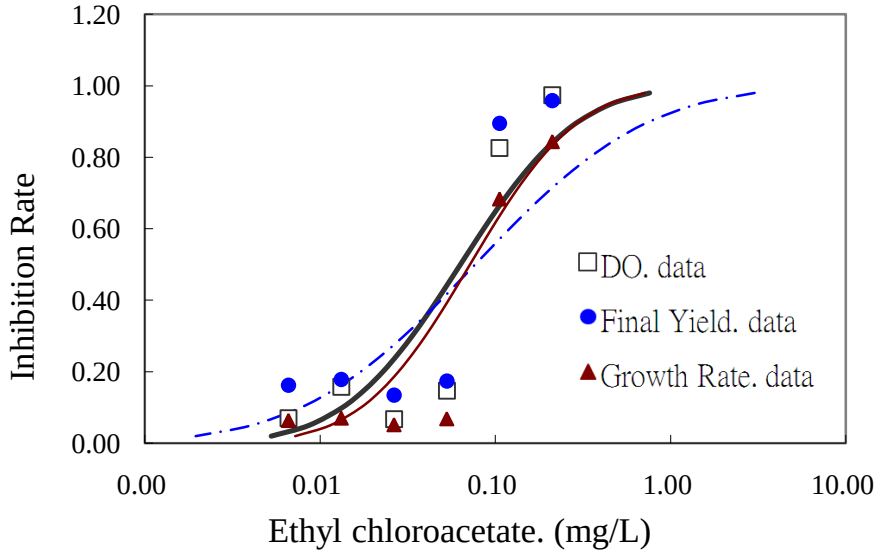
0.01
0.10
1.00
10.00
100.00
Ethyl fluoroacetate (mg/L)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Inhibition Rate
DO. data
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0.01
0.10
1.00
10.00
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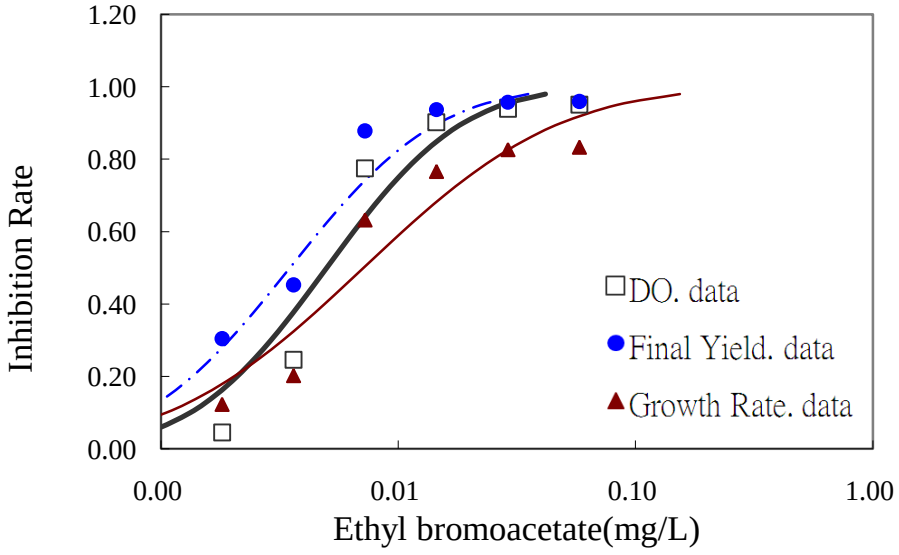
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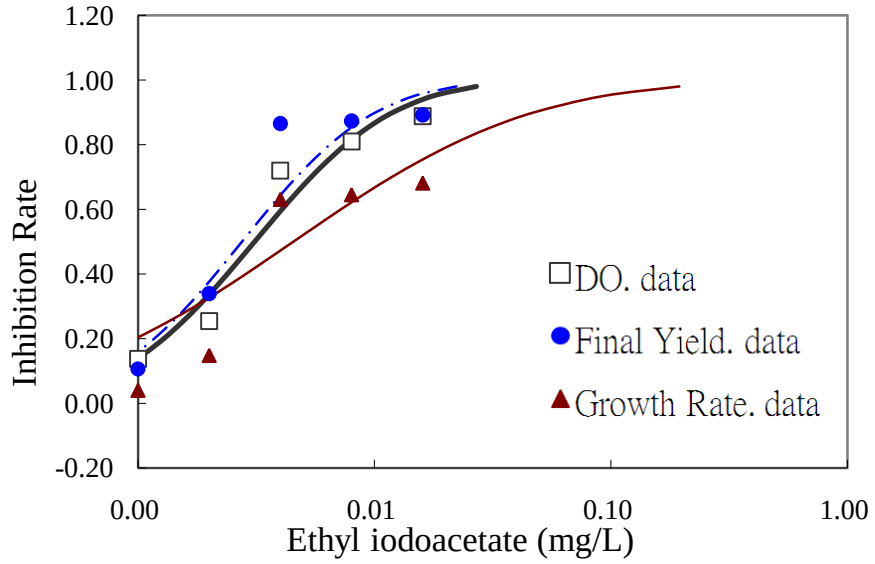
0.60
0.40
0.20
0.00
Inhibition Rate
DO. data
Final Yield. data
Growth Rate. data
0.00
0.01
0.10
1.00
Ethyl bromoacetate(mg/L)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0.40
0.20
0.00
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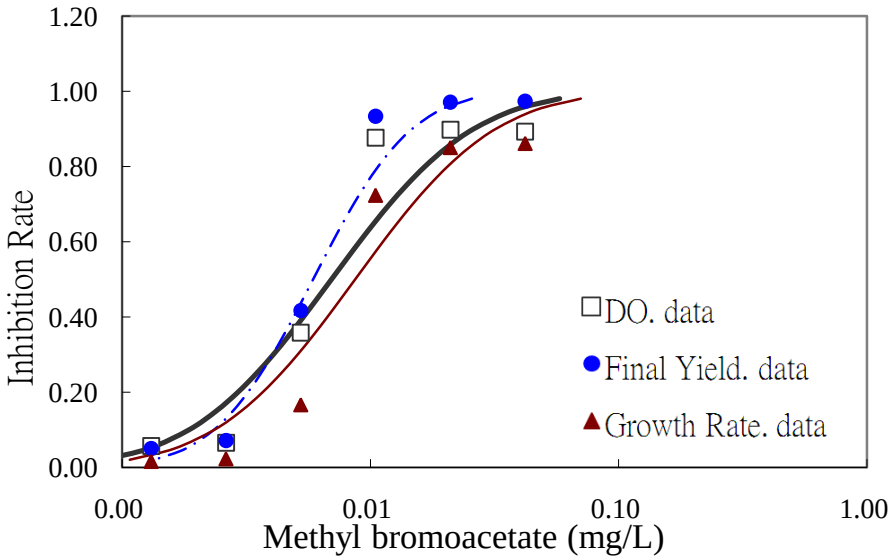
Inhibition Rate
DO. data
Final Yield. data
Growth Rate. data
0.00
0.01
0.10
1.00
Ethyl iodoacetate (mg/L)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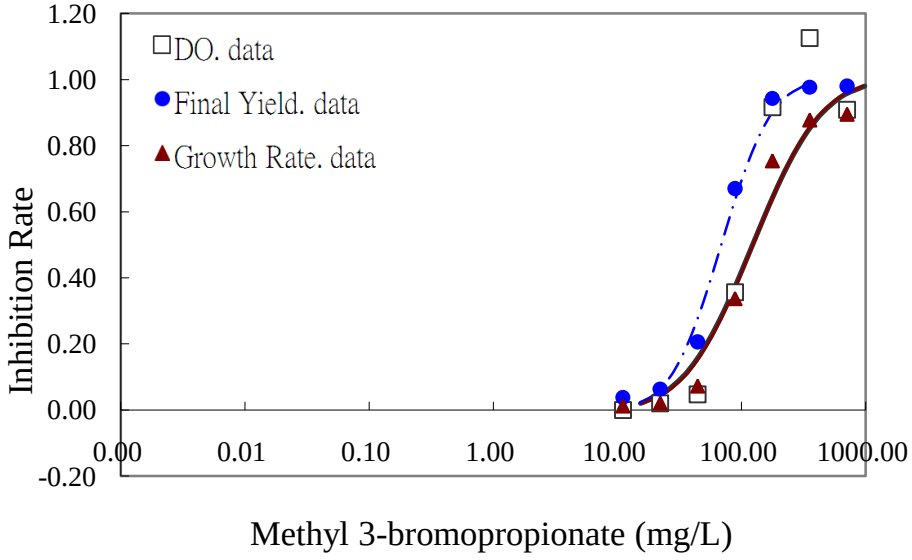
0.80
0.60
0.40
0.20
0.00
Inhibition Rate
DO. data
Final Yield. data
Growth Rate. data
0.00
0.01
0.10
1.00
Methyl bromoacetate (mg/L)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0.80
0.60
0.40
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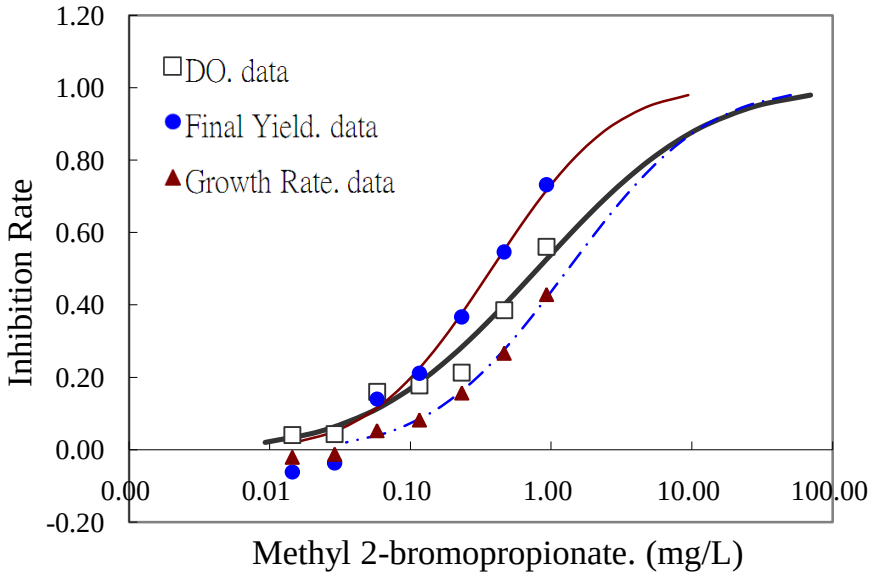
0.00
-0.20
Inhibition Rate
DO. data
Final Yield. data
Growth Rate. data
0.00
0.01
0.10
1.00
10.00
100.00
1000.00
Methyl 3-bromopropionate (mg/L)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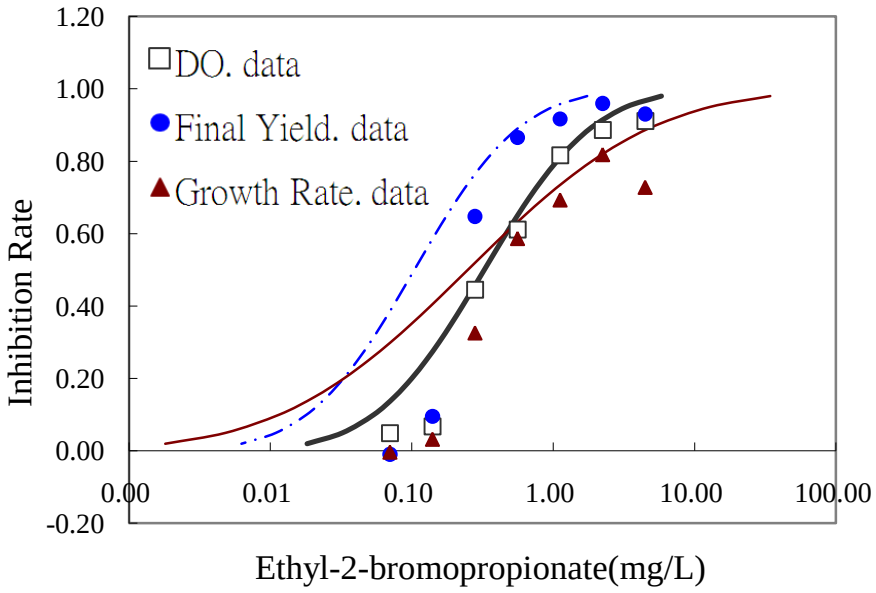
0.80
0.60
0.40
0.20
0.00
-0.20
Inhibition Rate
DO. data
Final Yield. data
Growth Rate. data
0.00
0.01
0.10
1.00
10.00
100.00
Methyl 2-bromopropionate. (mg/L)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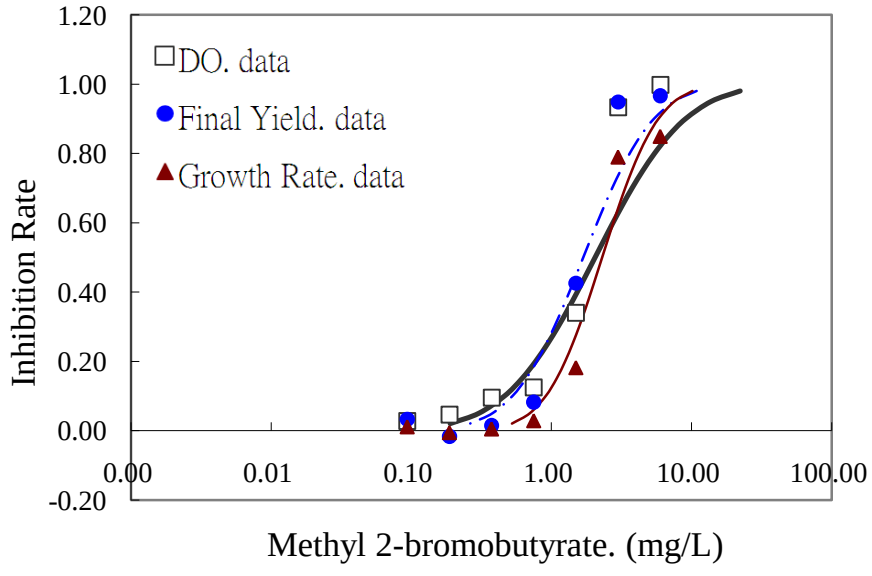
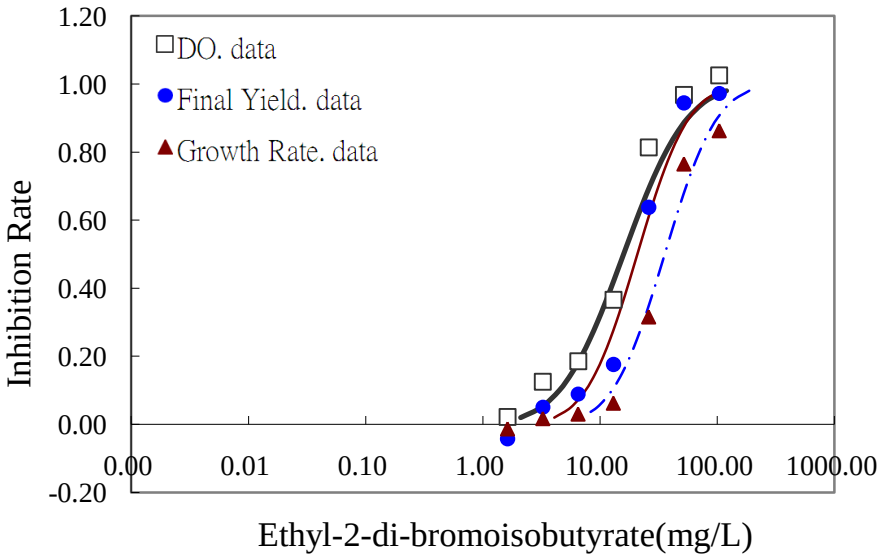
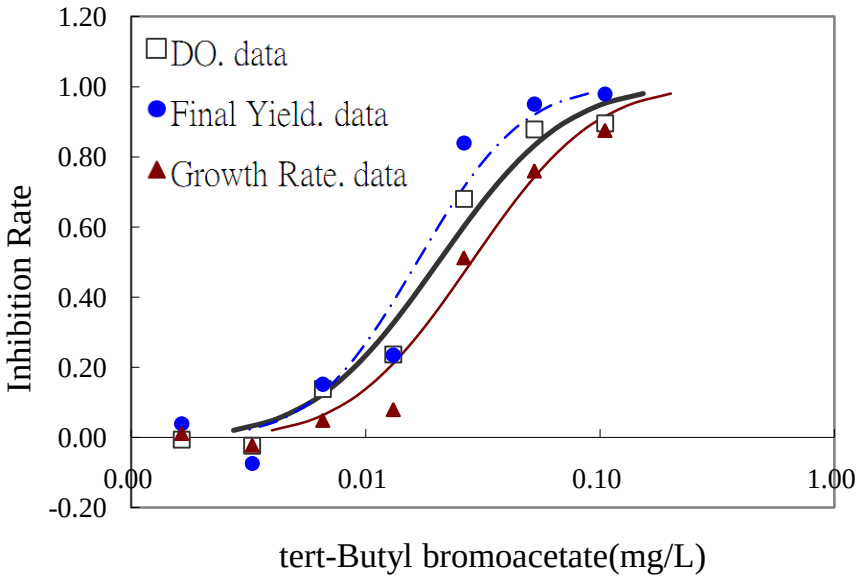
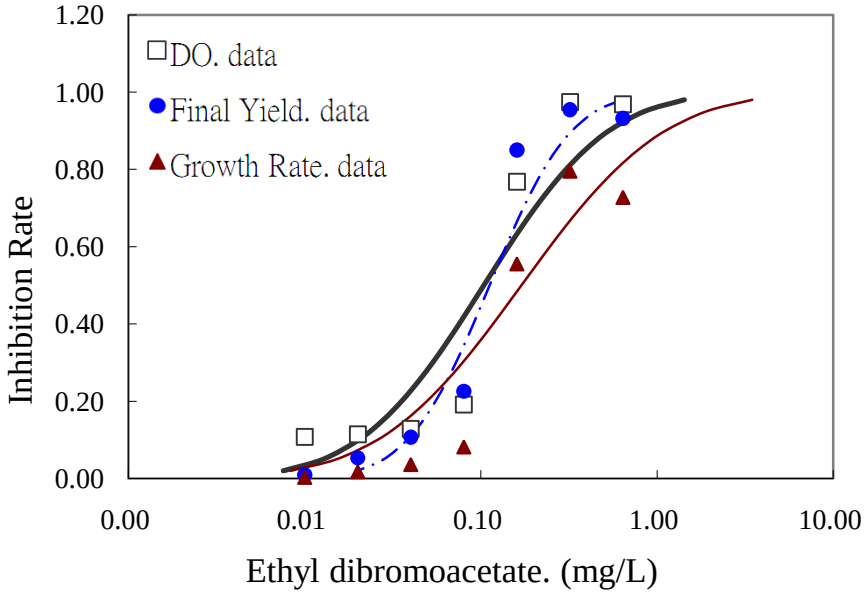
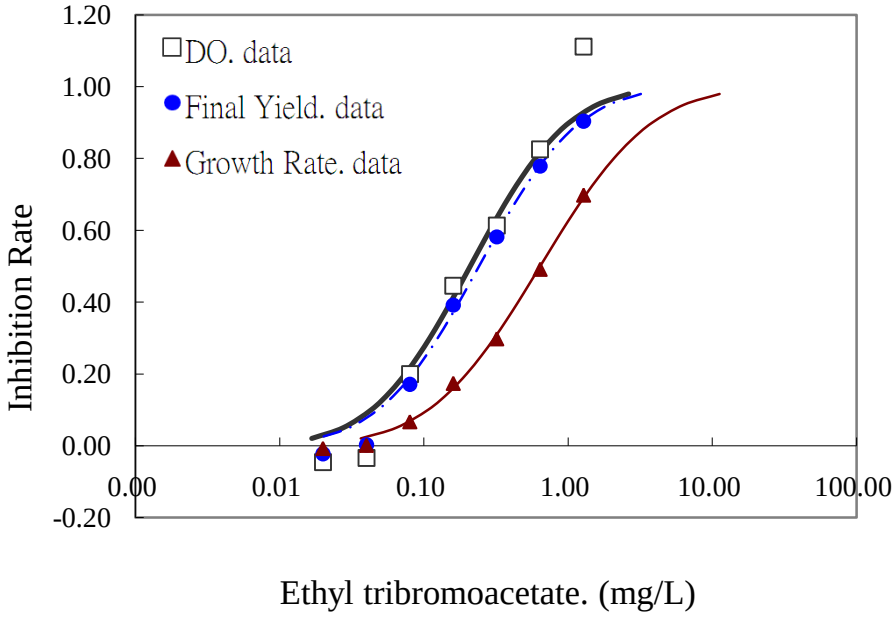
1.00
0.80
0.60
0.40
0.20
0.00
-0.20
Inhibition Rate
DO. data
Final Yield. data
Growth Rate. data
0.00
0.01
0.10
1.00
10.00
100.00
Ethyl-2-bromopropionate(mg/L)

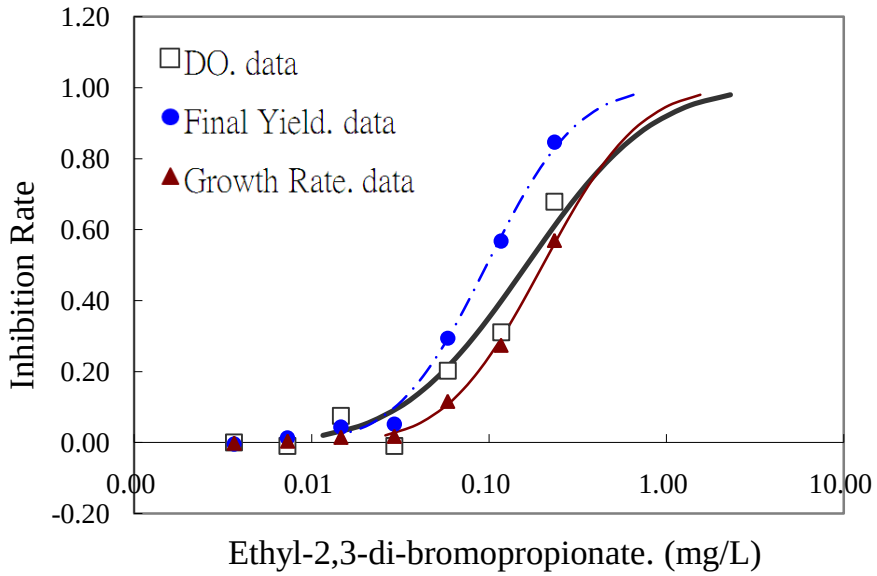

1.20
1.00
0.80
0.60
0.40
0.20
0.00
-0.20
Inhibition Rate
DO. data
Final Yield. data
Growth Rate. data
0.00
0.01
0.10
1.00
10.00
100.00
Methyl 2-bromobutyrate. (mg/L)


DO. data
Final Yield. data
Growth Rate. data
Inhibition Rate
1.20
1.00
0.80
0.60
0.40
0.20
0.00
-0.20
0.00
0.01
0.10
1.00
10.00
100.00
1000.00
Ethyl-2-di-bromoisobutyrate(mg/L)


DO. data
Final Yield. data
Growth Rate. data
Inhibition Rate
1.20
1.00
0.80
0.60
0.40
0.20
0.00
-0.20
0.00
0.01
0.10
1.00
tert-Butyl bromoacetate(mg/L)


DO. data
Final Yield. data
Growth Rate. data
Inhibition Rate
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
0.01
0.10
1.00
10.00
Ethyl dibromoacetate. (mg/L)


1.20
1.00
0.80
0.60
0.40
0.20
0.00
-0.20
Inhibition Rate
DO. data
Final Yield. data
Growth Rate. data
0.00
0.01
0.10
1.00
10.00
100.00
Ethyl tribromoacetate. (mg/L)


1.20
1.00
0.80
0.60
0.40
0.20
0.00
-0.20
Inhibition Rate
DO. data
Final Yield. data
Growth Rate. data
0.00
0.01
0.10
1.00
10.00
Ethyl-2,3-di-bromopropionate. (mg/L)

附錄二、其他迴歸

(一) N=12(去掉 Ethyl fluoroacetate(1)、Methyl 3-bromopropionate(6))

$Log(1/EC_{50,\ \triangle DO}) = 4.09 + 0.829\ Log(1/RC_{50}) - 0.684\ Log\ Kow$

$R^2 = 0.824,\ R_{pred}^2 = 0.687,\ S = 0.493,\ F = 21.3$

$Log(1/EC_{50,FY}) = 4.14 + 0.882\ Log(1/RC_{50}) - Log\ Kow$

$R^2 = 0.832,\ R_{pred}^2 = 0.692,\ S = 0.506,\ F = 22.3$

$Log(1/EC_{50,GR}) = 4.02 + 0.856\ Log(1/RC_{50}) - 0.781\ Log\ Kow$

$R^2 = 0.790,\ R_{pred}^2 = 0.624,\ S = 0.489,\ F = 40.2$

※Log Kow 的係數為負，不合理，故不收錄於討論中。

$Log(1/EC_{50,\ \triangle DO}) = 3.46 + 0.960\ Log(1/RC_{50}) + 0.644\ E_{LUMO}$

$R^2 = 0.787,\ R_{pred}^2 = 0.630,\ S = 0.541,\ F = 16.6$

$Log(1/EC_{50,FY}) = 3.52 + 1.02\ Log(1/RC_{50}) + 0.692\ E_{LUMO}$

$R^2 = 0.761,\ R_{pred}^2 = 0.568,\ S = 0.614,\ F = 14.3$

$Log(1/EC_{50,GR}) = 3.33 + 1.02\ Log(1/RC_{50}) + 0.784\ E_{LUMO}$

$R^2 = 0.805,\ R_{pred}^2 = 0.640,\ S = 0.546,\ F = 22.3$

※E_{LUMO} 的係數為正，不合理，故不收錄於討論中。

$Log(1/EC_{50,\ \triangle DO}) = 4.04 + 0.876\ Log(1/RC_{50}) + 0.231\ E_{LUMO} - 0.551\ Log\ Kow$

$R^2 = 0.829,\ R_{pred}^2 = 0.633,\ S = 0.514,\ F = 12.9$

$Log(1/EC_{50,FY}) = 4.08 + 0.942\ Log(1/RC_{50}) + 0.292\ E_{LUMO} - 0.532\ Log\ Kow$

$R^2 = 0.840,\ R_{pred}^2 = 0.652,\ S = 0.524,\ F = 14.0$

$Log(1/EC_{50,GR}) = 3.94 + 0.928\ Log(1/RC_{50}) + 0.349\ E_{LUMO} - 0.579\ Log\ Kow$

$R^2 = 0.802,\ R_{pred}^2 = 0.575,\ S = 0.593,\ F = 10.8$

※Log Kow 的係數為負，E_{LUMO} 的係數為正，不合理，故不收錄於討論中。

(二)N=10(去掉 Ethyl fluoroacetate(1)、Methyl 3-bromopropionate(6)、Ethyl-2,3-di-bromopropionate(14))

$Log(1/EC_{50,\ \triangle DO}) = - 0.397 - 14.6\ H\text{-}carbon$

$R^2 = 0.721,\ R_{pred}^2 = 0.642,\ S = 0.619,\ F = 23.3$

$Log(1/EC_{50,FY}) = - 0.514 - 15.1\ H\text{-}carbon$

$R^2 = 0.702,\ R_{pred}^2 = 0.610,\ S = 0.675,\ F = 21.1$

$Log(1/EC_{50,GR}) = - 0.931 - 15.8\ H\text{-}carbon$

$R^2 = 0.737,\ R_{pred}^2 = 0.664,\ S = 0.643,\ F = 25.2$

$Log(1/EC_{50,\ \triangle DO}) = - 0.400 - 14.6\ H\text{-}carbon - 0.006\ E_{LUMO}$

$R^2 = 0.721,\ R_{pred}^2 = 0.652,\ S = 0.657,\ F = 10.4$

$Log(1/EC_{50,FY})$= - 0.506 - 15.2 H-carbon + 0.018 E_{LUMO}

R^2 = 0.702, R_{pred}^2 = 0.442, S = 0.715, F =9.42

$Log(1/EC_{50,GR})$= - 0.877 - 15.9 H-carbon + 0.127 E_{LUMO}

R^2 = 0.740, R_{pred}^2 = 0.523, S = 0.679, F =11.4

※E_{LUMO} 的係數為正，不合理，故不收錄於討論中。

$Log(1/EC_{50,\ \Delta DO})$= 0.09 - 14.0 H-carbon - 0.229 Log Kow

R^2 = 0.733, R_{pred}^2 = 0.631, S = 0.643, F =11.0

$Log(1/EC_{50,FY})$ = 0.03 - 14.6 H-carbon - 0.257 Log Kow

R^2 = 0.715, R_{pred}^2 = 0.594, S = 0.657, F =10.0

$Log(1/EC_{50,GR})$ = - 0.26 - 15.1 H-carbon - 0.317 Log Kow

R^2 = 0.756, R_{pred}^2 = 0.695, S = 0.658, F =12.4

※Log Kow 的係數為負，不合理，故不收錄於討論中。

(三) N=9(去掉 Ethyl fluoroacetate(1)、Methyl 3-bromopropionate(6)、Ethyl dibromoacetate(12)、Ethyl tribromoacetate(13)、Ethyl-2,3-di-bromopropionate(14))

$Log(1/EC_{50,\ \Delta DO})$ = 3.17 + 1.07 $Log(1/RC_{50})$

R^2 = 0.939, R_{pred}^2 = 0.893, S = 0.328, F =108

$Log(1/EC_{50,FY})$= 3.20 + 1.13 $Log(1/RC_{50})$

R^2 = 0.947, R_{pred}^2 = 0.916, S = 0.323, F =124

$Log(1/EC_{50,GR})$ = 2.96 + 1.13 $Log(1/RC_{50})$

R^2 = 0.916, R_{pred}^2 = 0.879, S = 0.410, F =76.8

$Log(1/EC_{50,\ \Delta DO})$ = 3.02 - 3.41 Halo + 1.06 $Log(1/RC_{50})$

R^2 = 0.940, R_{pred}^2 = 0.798, S = 0.350, F =47.3

$Log(1/EC_{50,FY})$ = 3.03 - 4.18 Halo + 1.12 $Log(1/RC_{50})$

R^2 = 0.948, R_{pred}^2 = 0.869, S = 0.343, F =55.0

$Log(1/EC_{50,GR})$= 3.04 + 1.8 Halo + 1.13 $Log(1/RC_{50})$

R^2 = 0.917, R_{pred}^2 = 0.719, S = 0.441, F =33.0

$Log(1/EC_{50,\ \Delta DO})$ = 0.81 - 12.9 ΔHalo - 0.093 Log Kow

R^2 = 0.630, R_{pred}^2 = 0.283, S = 0.874, F =5.10

$Log(1/EC_{50,FY})$ = 0.65 - 13.6 ΔHalo - 0.055 Log Kow

R^2 = 0.622, R_{pred}^2 = 0.213, S = 0.929, F =4.93

$Log(1/EC_{50,GR})$= 0.15 - 14.6 ΔHalo - 0.011 Log Kow

R^2 = 0.679, R_{pred}^2 = 0.226, S = 0.868, F =6.33

※Log Kow 的係數為負，不合理，故不收錄於討論中。

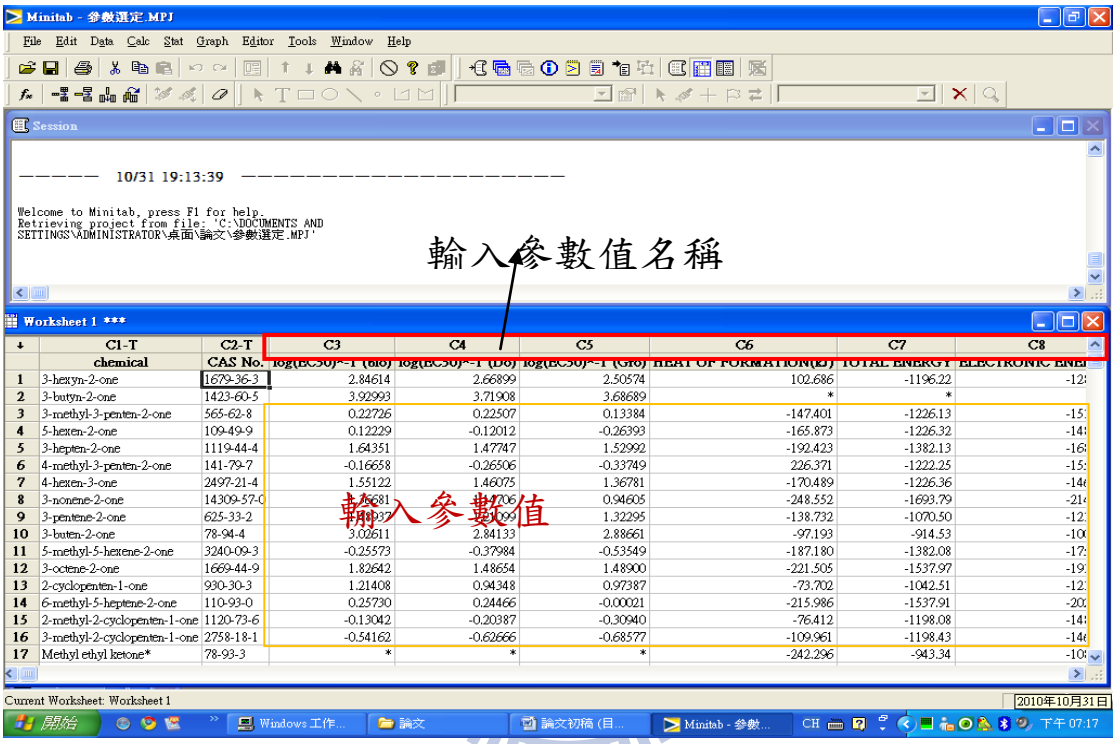
附錄三、統計方法

(一)一般迴歸分析法

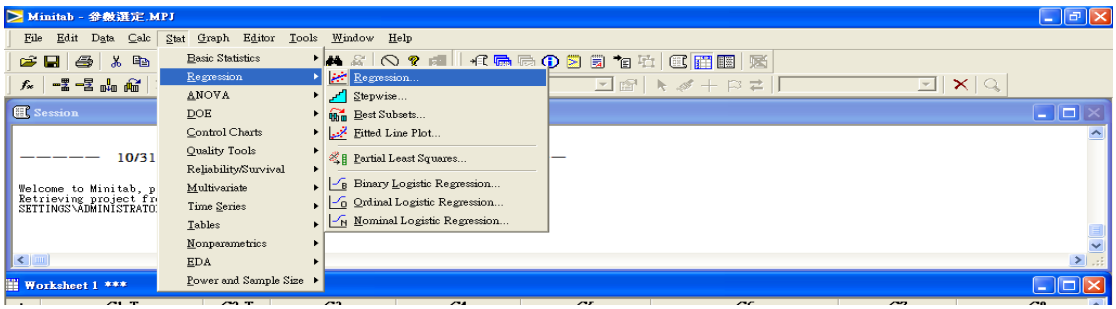
1.先安裝好 Minitab 15 統計軟體

2.打開軟體，新建立一個檔案

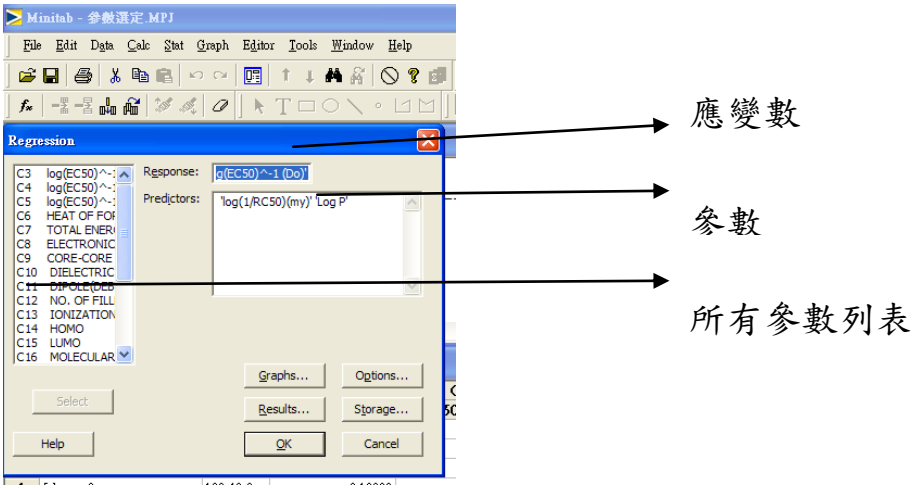
3.將所有參數值鍵入，以及試驗毒化物名稱



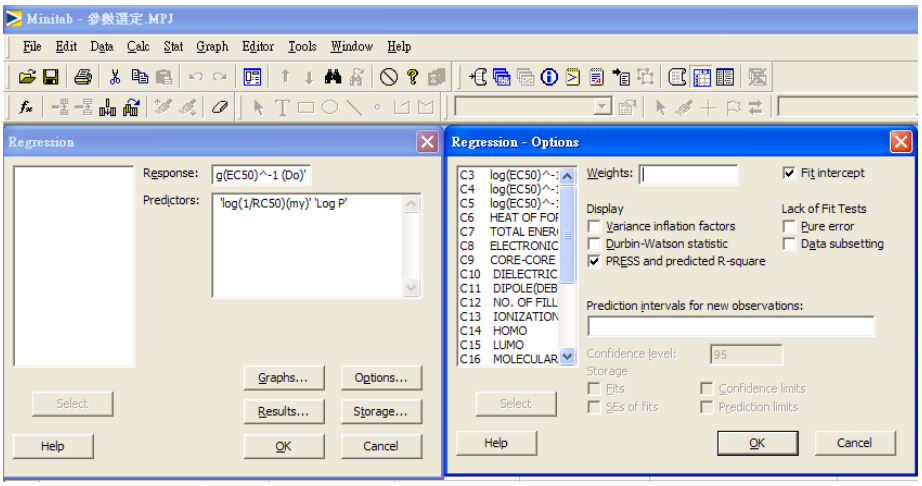
4.一般迴歸分析，選擇 Stat→Regression



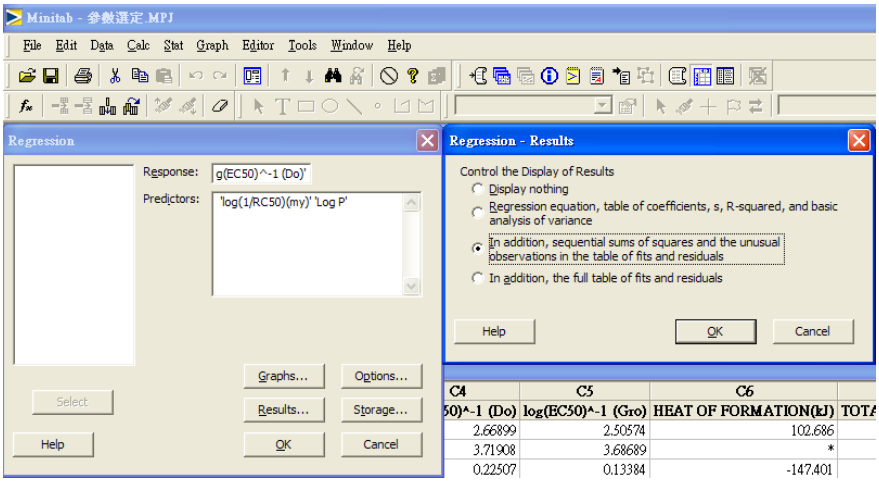
5.挑選應變數與參數



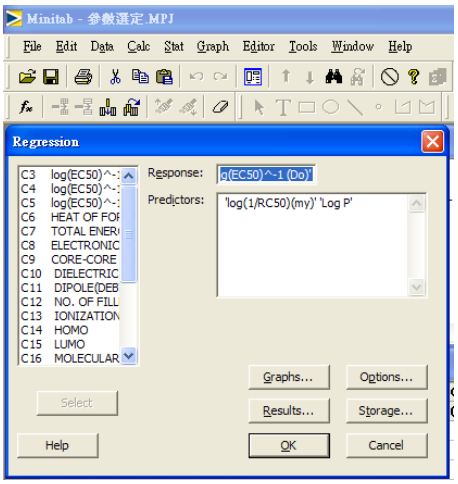
6.點選 options→勾選其圖片勾選處→點 OK



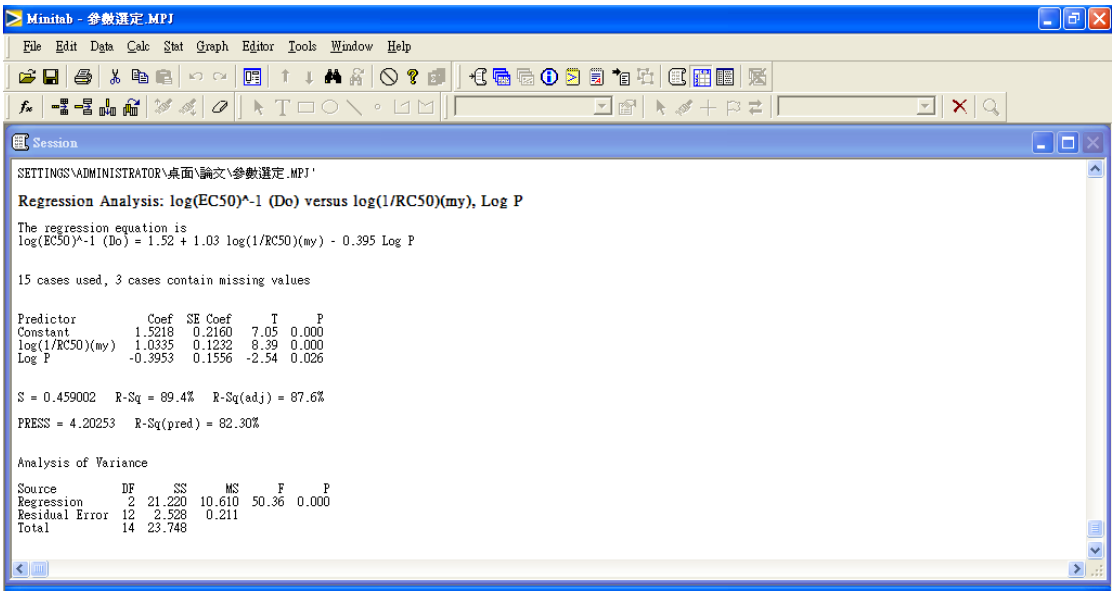
7. 點選 Results→勾選其圖片勾選處→點 OK



8.回畫面之後→點選 OK

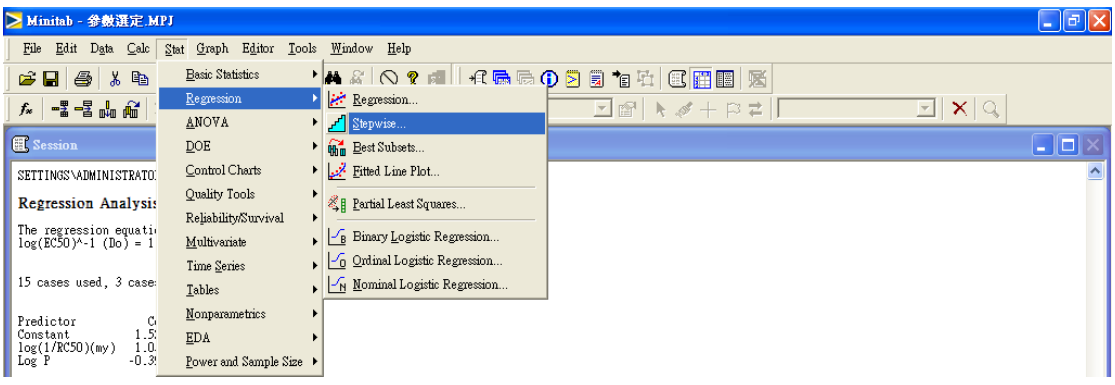


9.結果如下

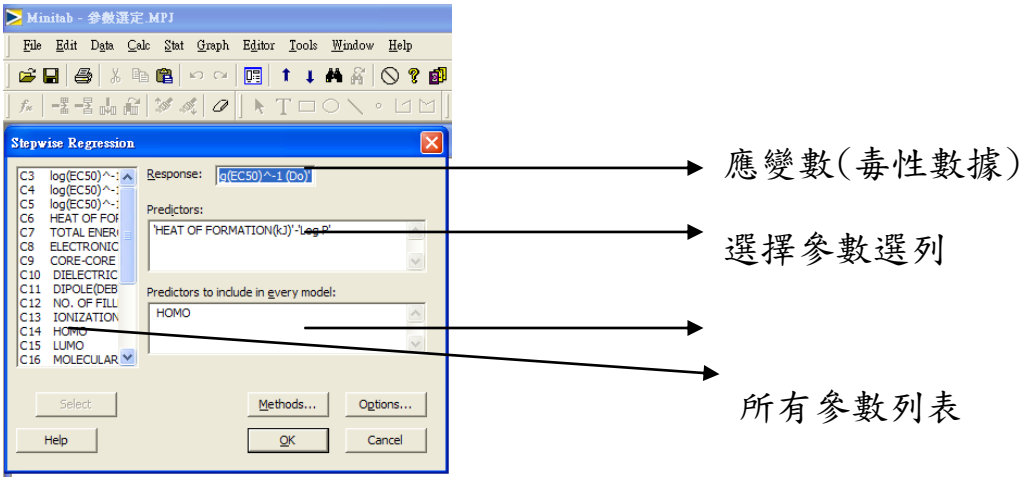


(二)逐步迴歸分析法適用挑選參數

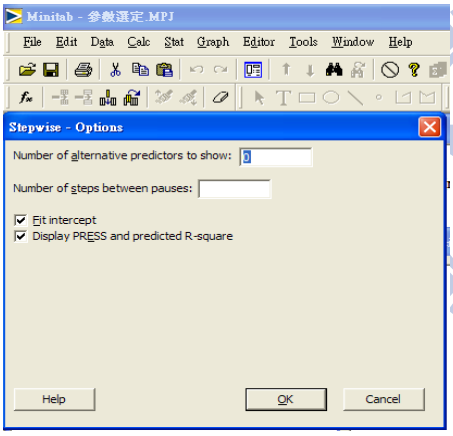
1. 逐步迴歸分析選擇 Stat→Regression→Stepwise



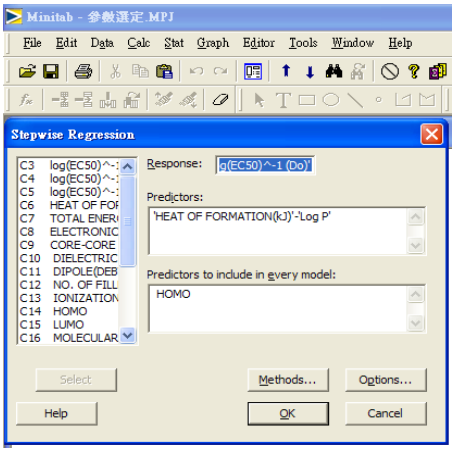
2. 挑選應變數與參數



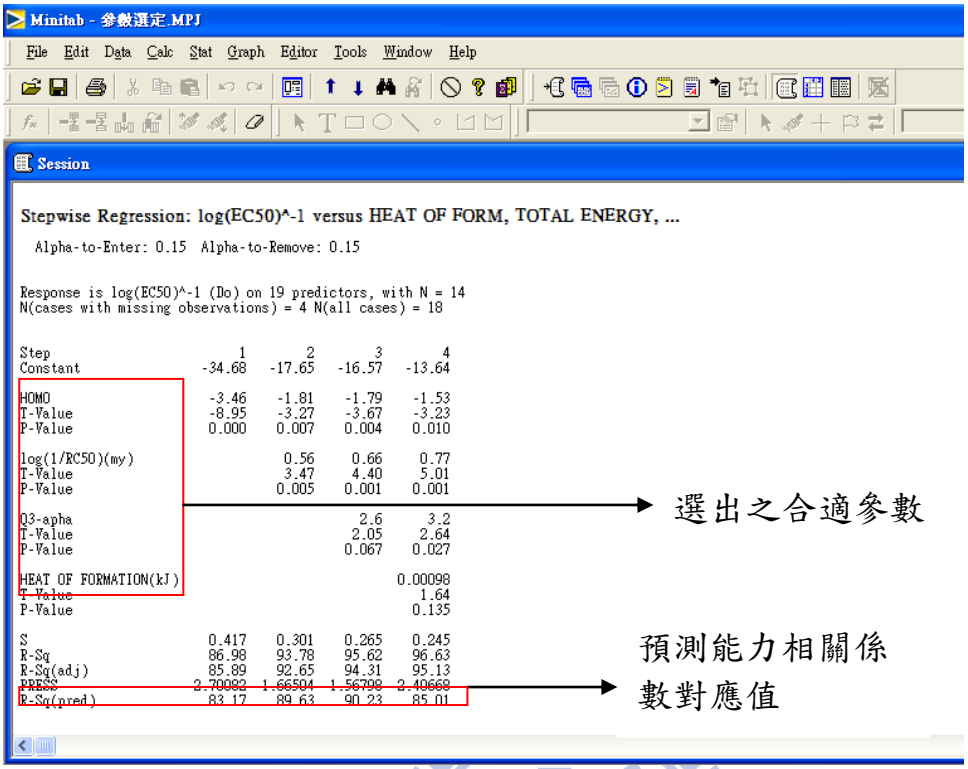
3. 點選 options→勾選其圖片勾選處→點 OK



4. 回畫面之後→點選 OK



5. 結果如下



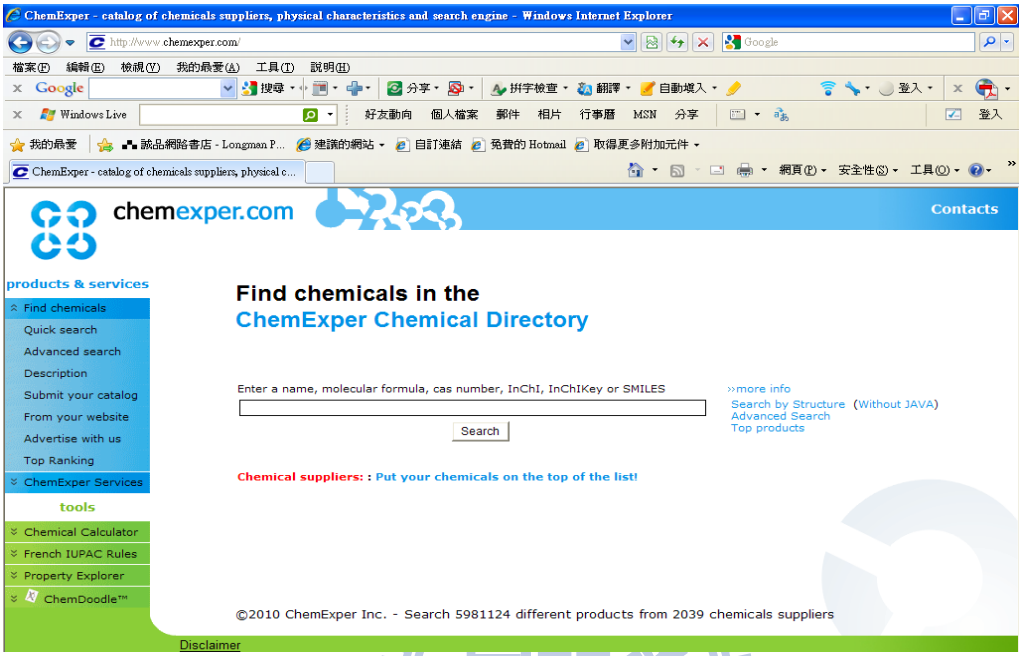
6.將逐步迴歸分析法所挑出之合適參數→跑一般迴歸分析即可。

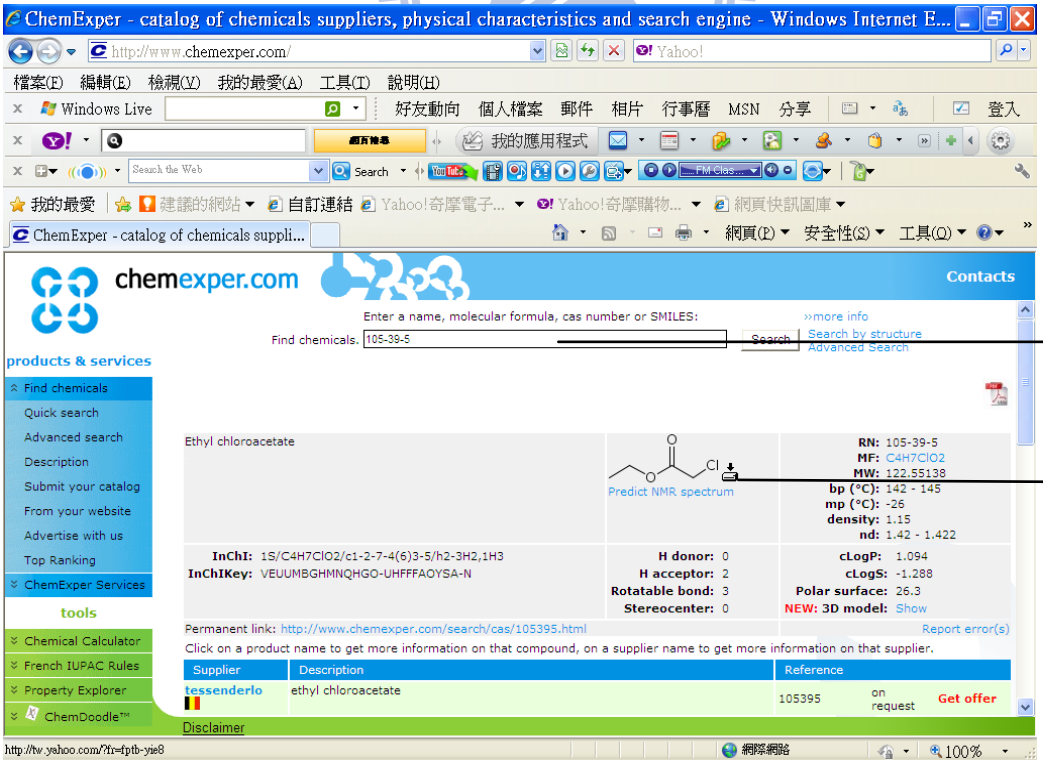
附錄四、參數計算軟體使用方法

1.先安裝好 CS Chem3D Pro 計算軟體

2.開啟檔案並建立一新檔

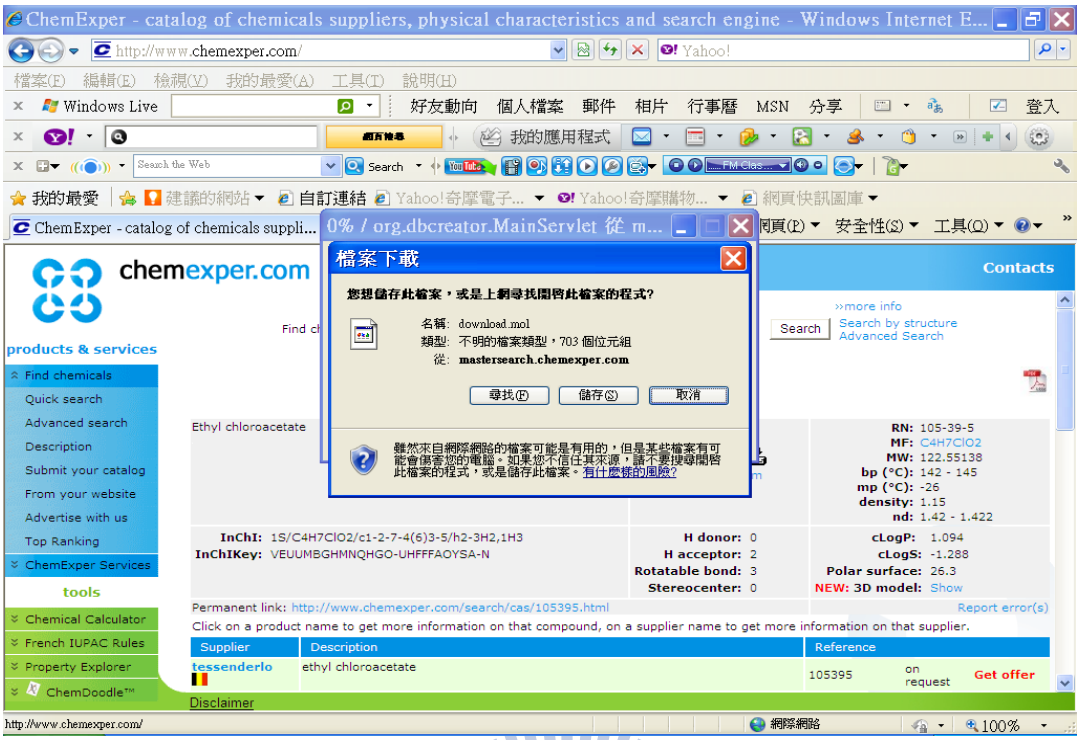
3.選擇欲分析之毒化物，至網站 http://www.chemexper.com/下載其分析結構式圖檔。以 Ethyl chloroacetate 為例，輸入 CAS No.



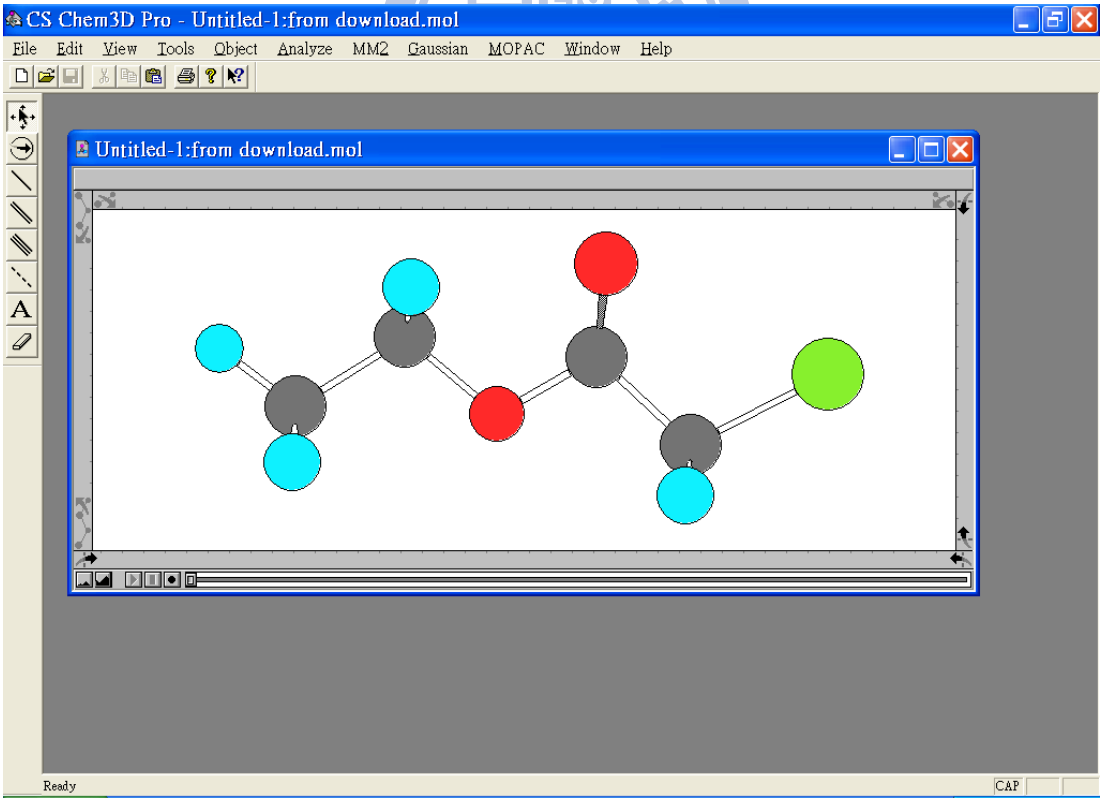


CAS No.

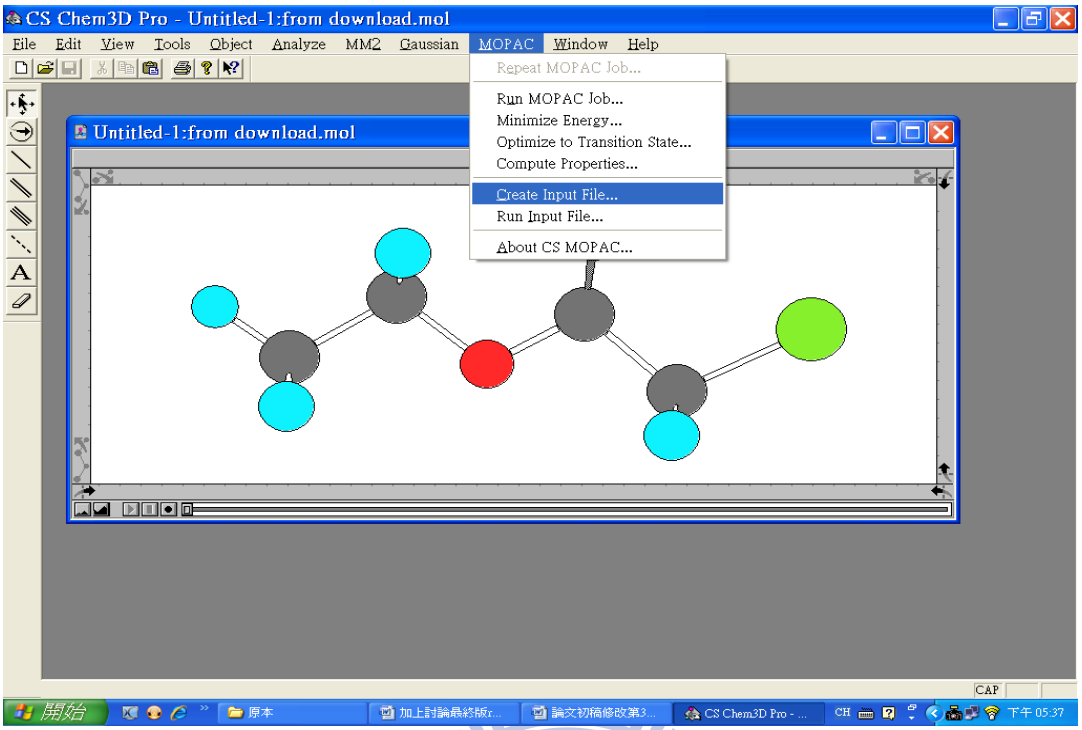
按此下載
結構式圖檔
(附檔名為.mol)



4.將所下載之圖檔利用 CS Chem3D Pro 開啟



5.點選 MOPAC→Create Input File



6.設定依照下面圖示設定

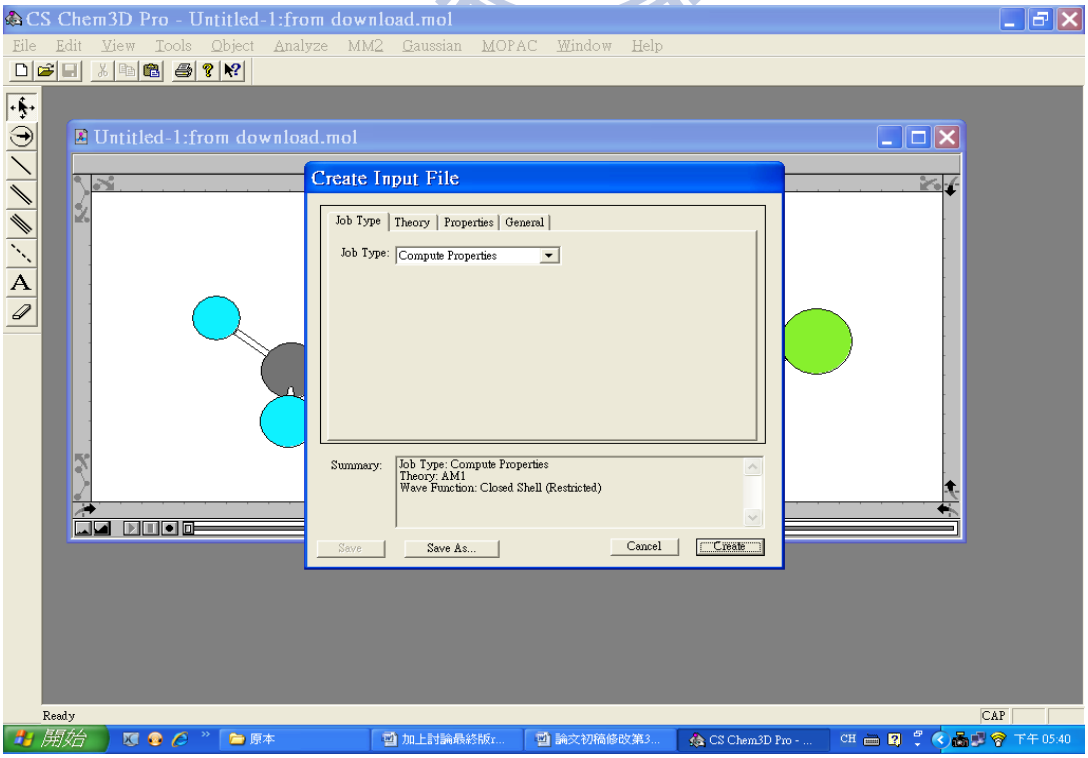
Job Type: Compute Properties

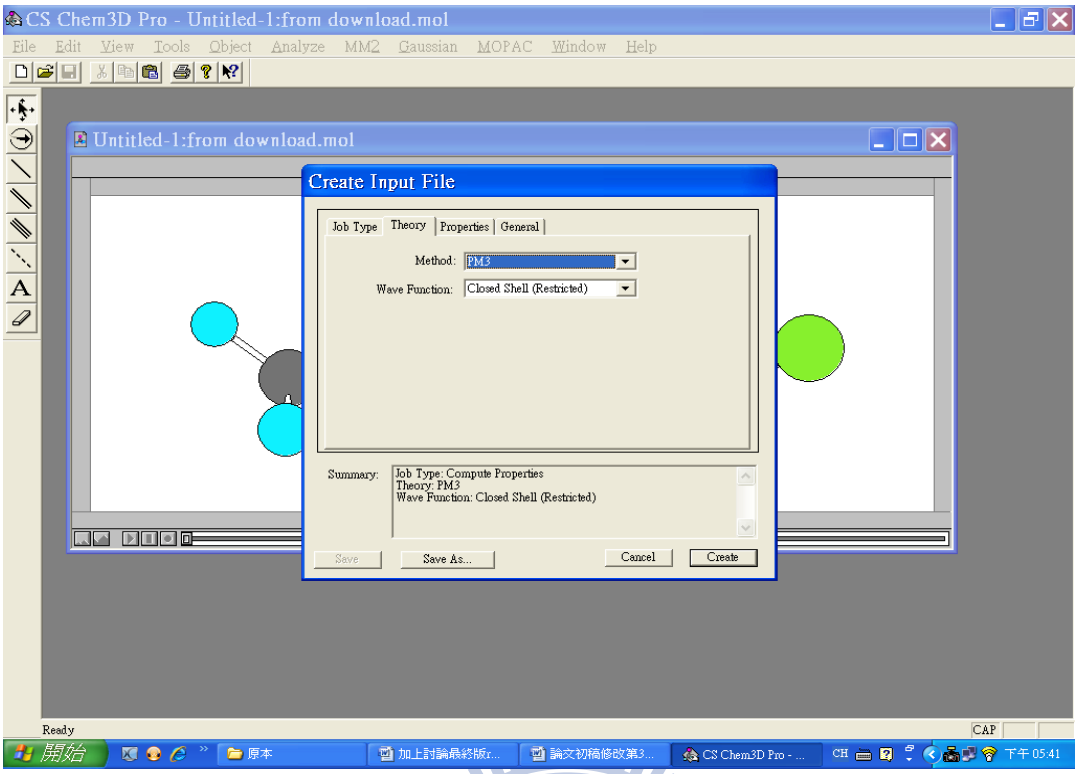
Theory: PM3

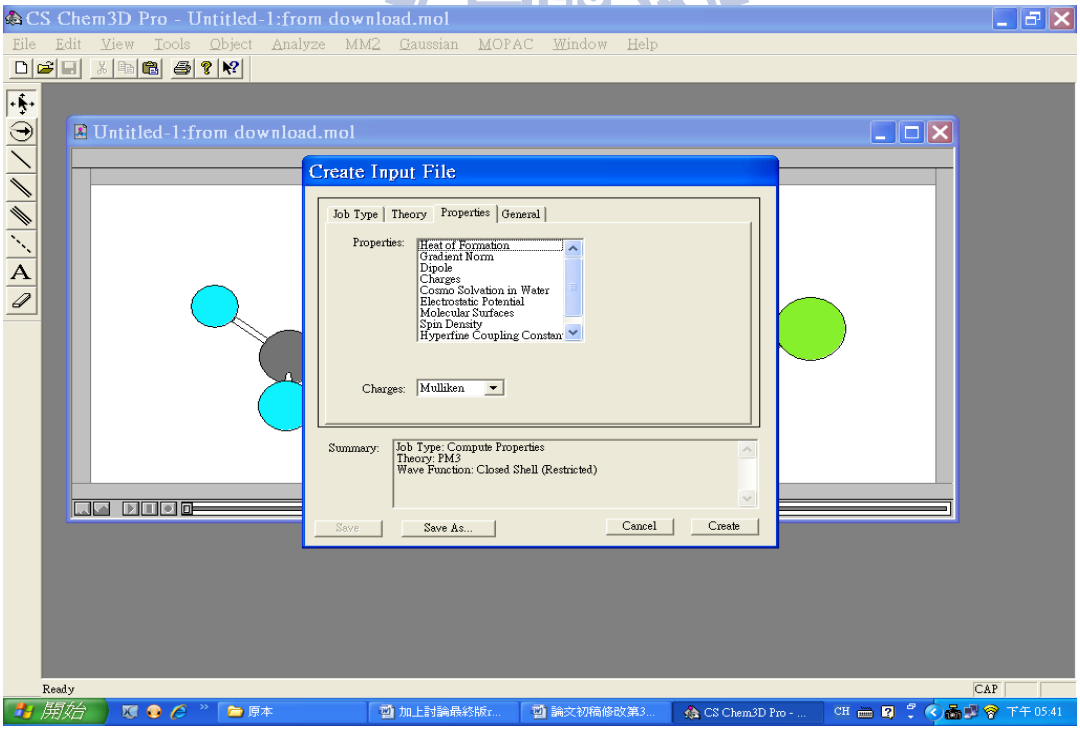
Wave Function: Closed Shell (Restricted)

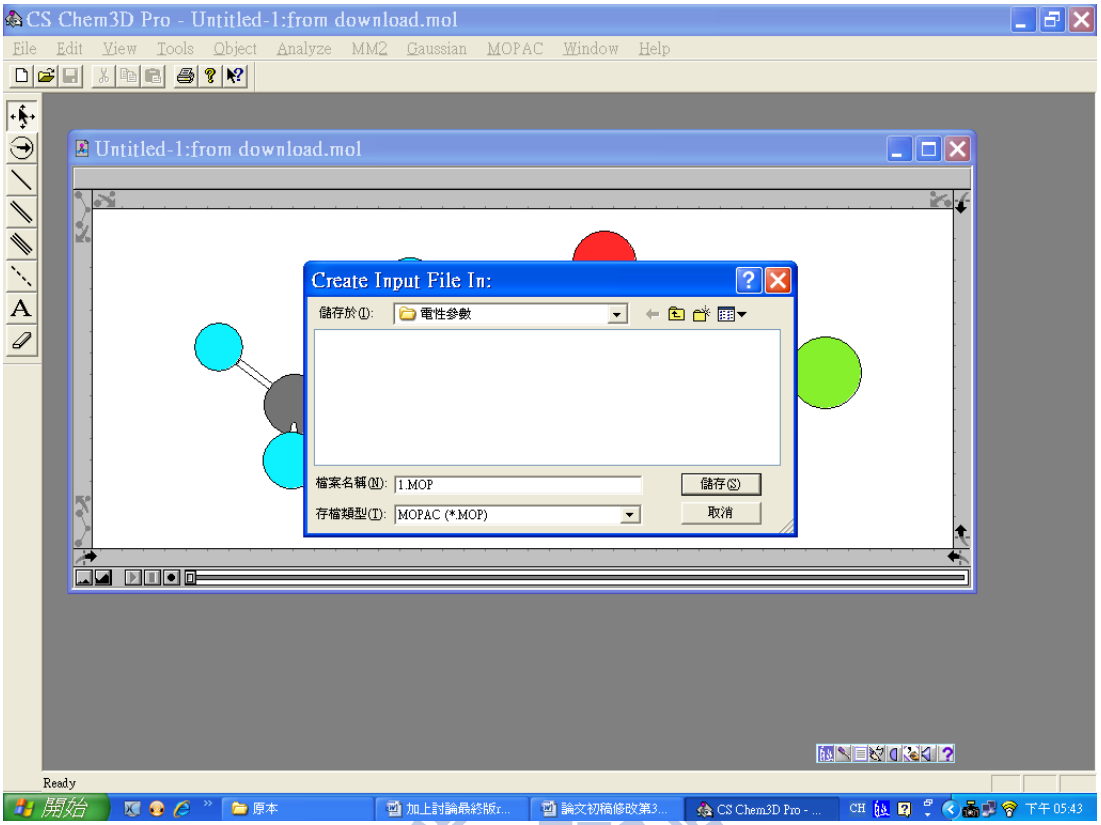
Properties:Mulliken Charges

設定完成後→按 Create→按儲存建檔(ex：1.MOPAC Input File)

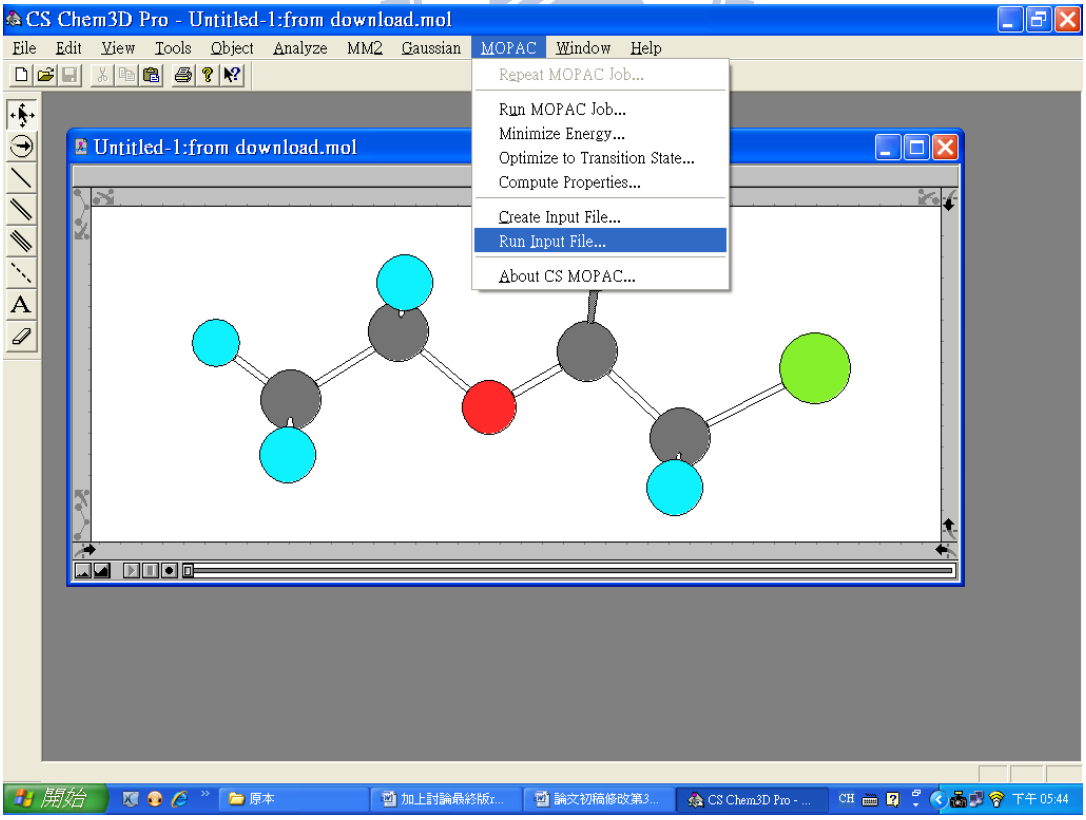


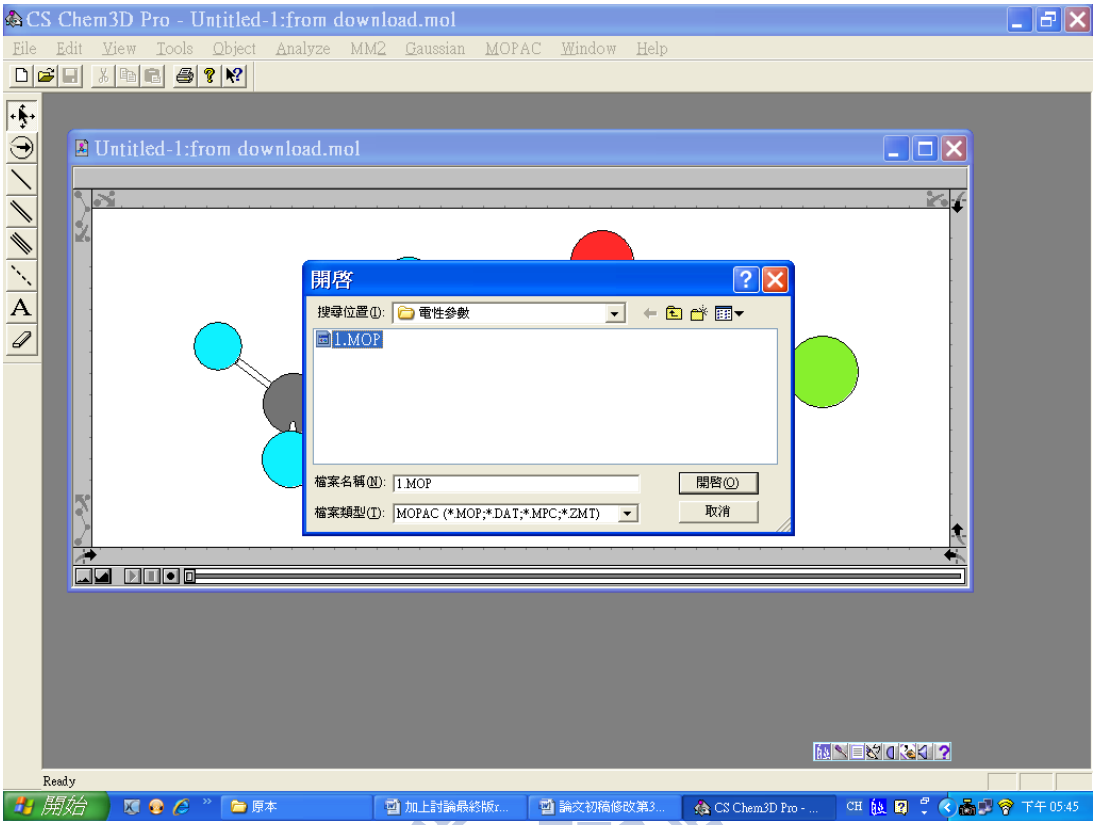

CS Chem3D Pro - Untitled-1:from download.mol
File Edit View Tools Object Analyze MM2 Gaussian MOPAC Window Help
Untitled-1:from download.mol
Create Input File
Job Type Theory Properties General
Method: PM3
Wave Function: Closed Shell (Restricted)
Summary:
Job Type: Compute Properties
Theory: PM3
Wave Function: Closed Shell (Restricted)
Save Save As... Cancel Create
Ready
CAP

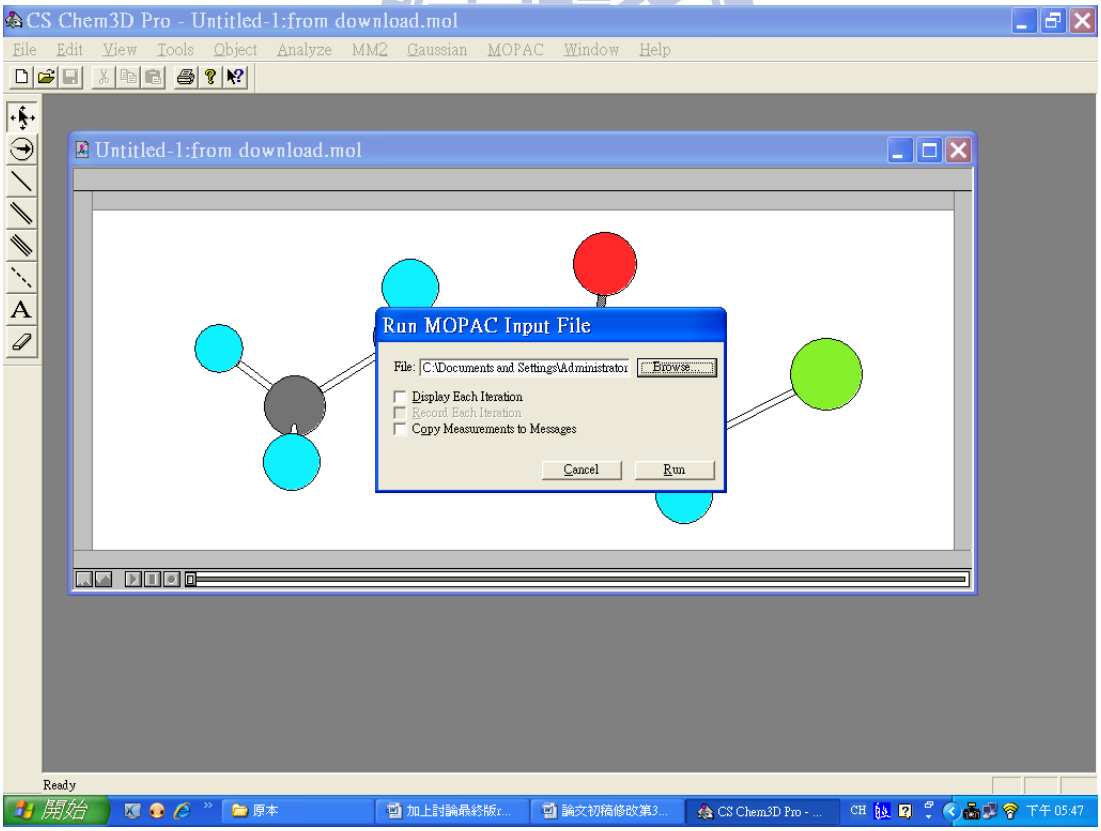

CS Chem3D Pro - Untitled-1:from download.mol
File Edit View Tools Object Analyze MM2 Gaussian MOPAC Window Help
Untitled-1:from download.mol
Create Input File
Job Type Theory Properties General
Properties:
Heat of Formation
Gradient Norm
Dipole
Charges
Cosmo Solvation in Water
Electrostatic Potential
Molecular Surfaces
Spin Density
Hyperfine Coupling Constan
Charges: Mulliken
Summary:
Job Type: Compute Properties
Theory: PM3
Wave Function: Closed Shell (Restricted)
Save Save As... Cancel Create
Ready
CAP

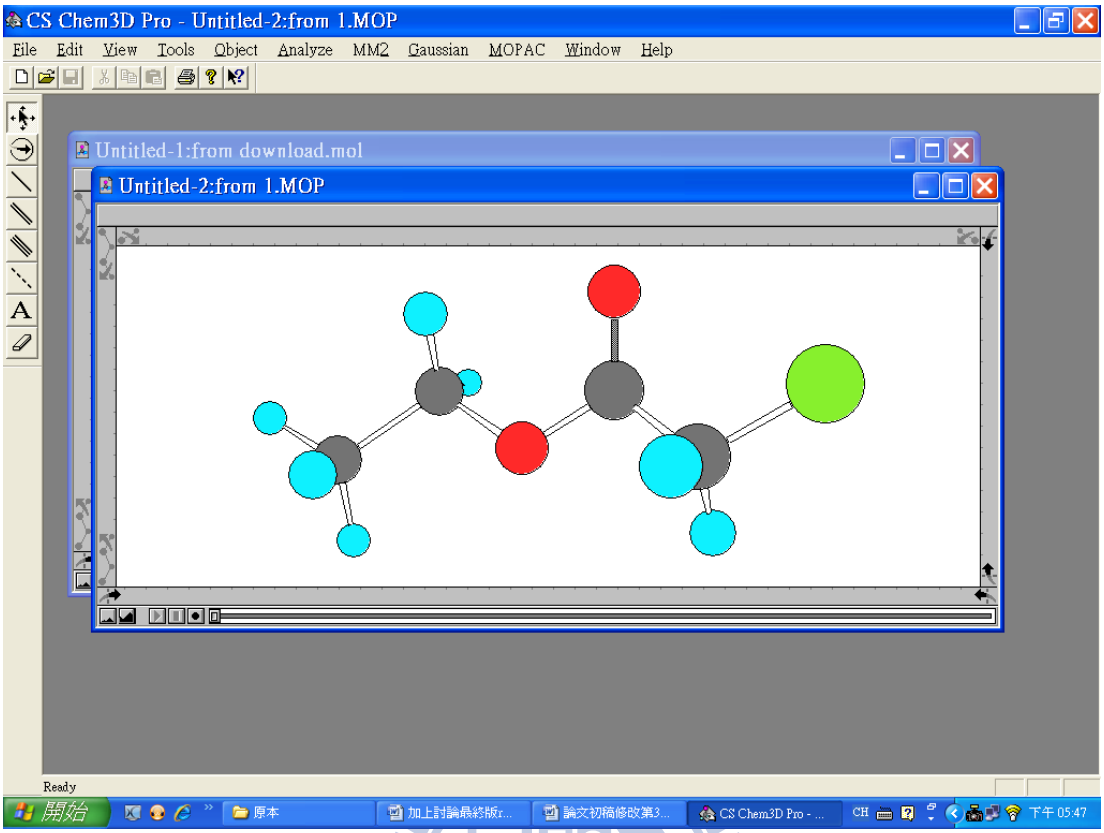


7.依照前步驟所建製之 MOPAC 檔→Run Input File
(ex：Browse→開啓 1.MOPAC Input File→Run)

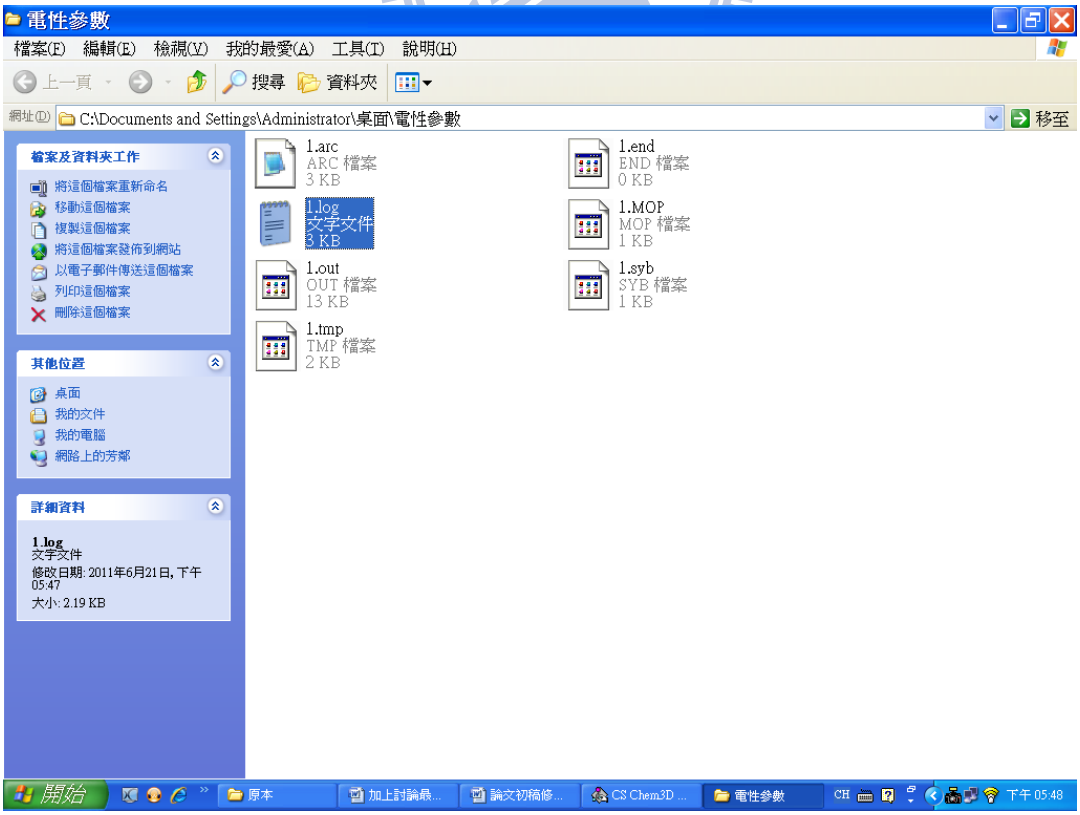


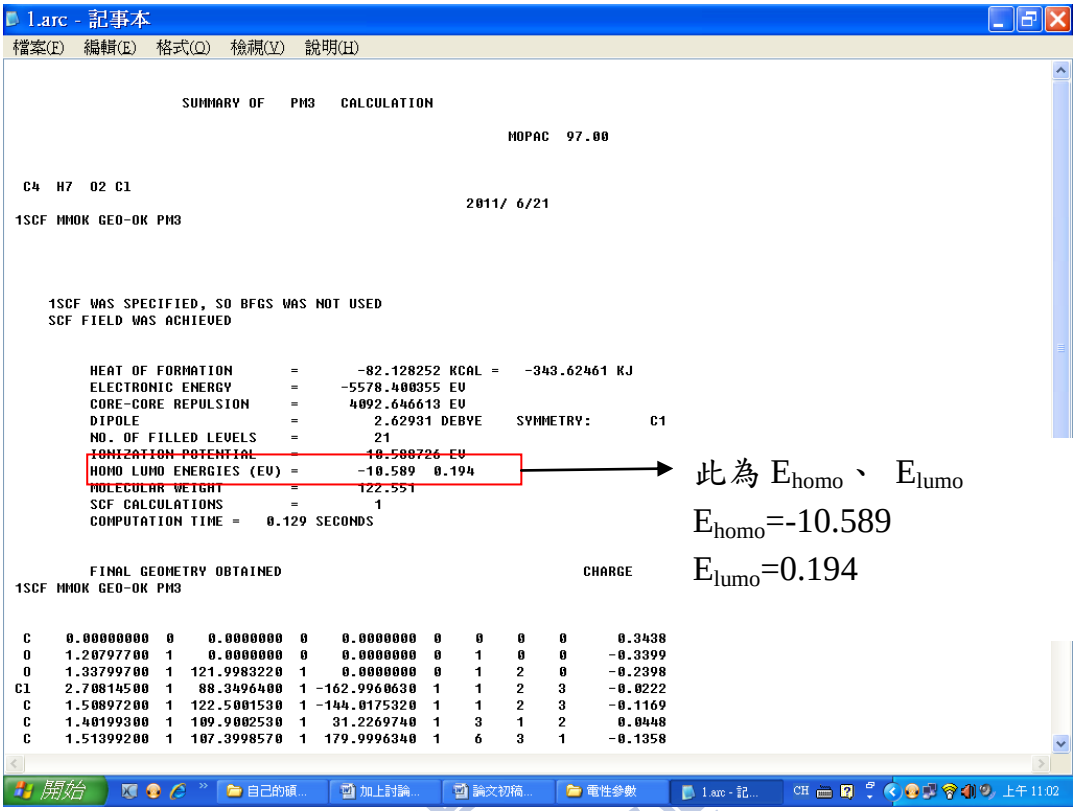

CS Chem3D Pro - Untitled-1:from download.mol
File Edit View Tools Object Analyze MM2 Gaussian MOPAC Window Help
Untitled-1:from download.mol
開啓
搜尋位置(I):
電性參數
1.MOP
檔案名稱(N):
1.MOP
開啓(O)
檔案類型(T):
MOPAC (*.MOP;*.DAT;*.MPC;*.ZMT)
取消
Ready
開始
原本
加上討論最終版r...
論文初稿修改第3...
CS Chem3D Pro - ...
CH
下午 05:45


CS Chem3D Pro - Untitled-1:from download.mol
File Edit View Tools Object Analyze MM2 Gaussian MOPAC Window Help
Untitled-1:from download.mol
Run MOPAC Input File
File: C:\Documents and Settings\Administrator
Browse...
Display Each Iteration
Record Each Iteration
Copy Measurements to Messages
Cancel
Run
Ready
開始
原本
加上討論最終版r...
論文初稿修改第3...
CS Chem3D Pro - ...
CH
下午 05:47



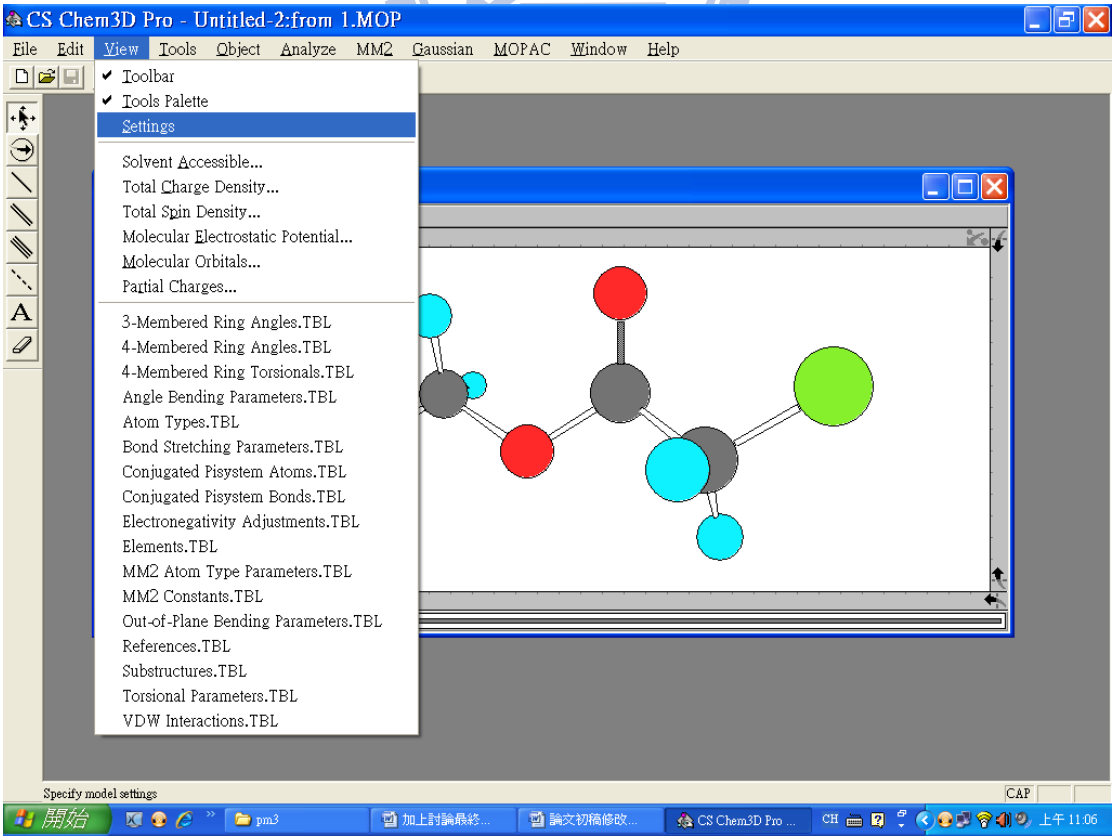
8.至所儲存資料夾→開啓記事本檔

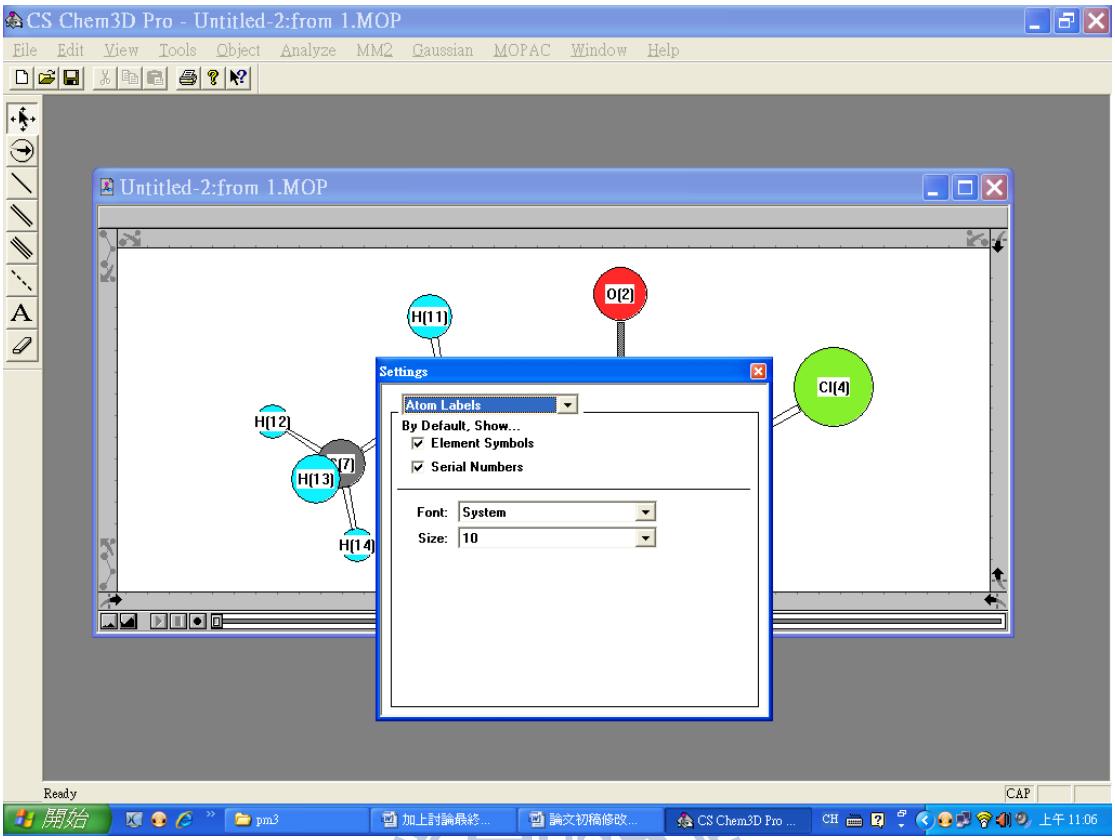


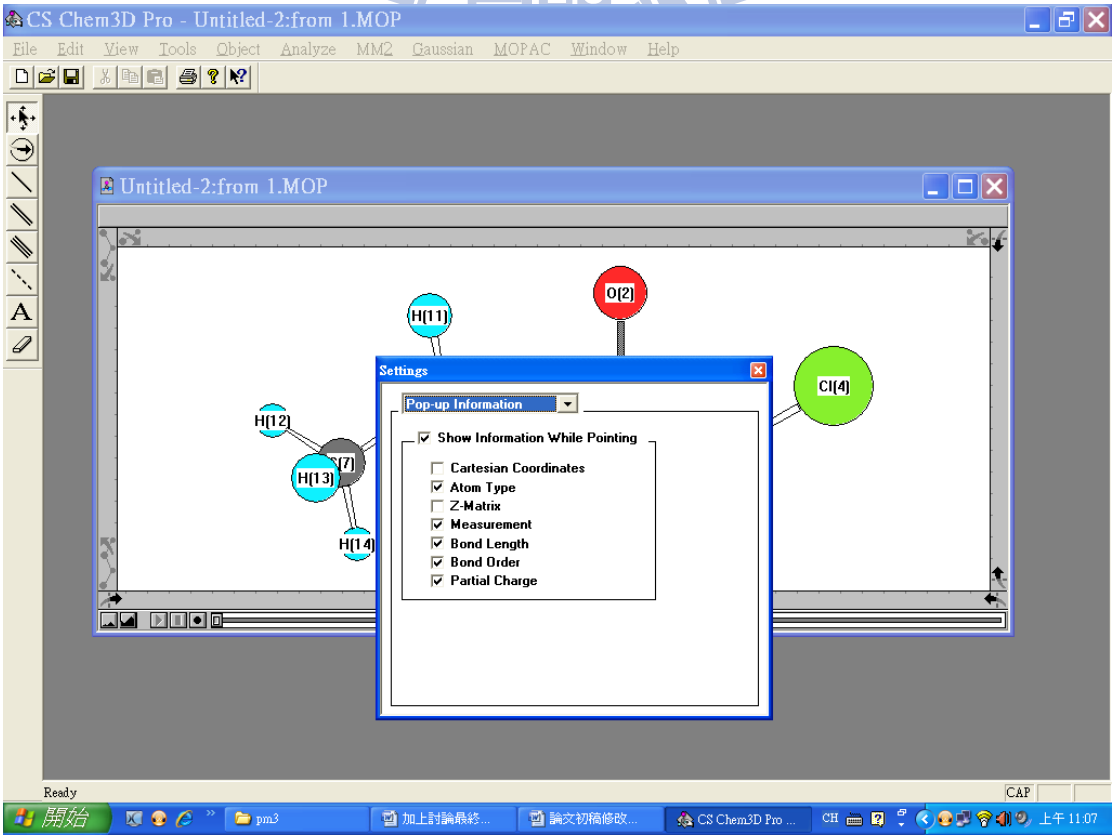


9.接著觀察部分電荷值

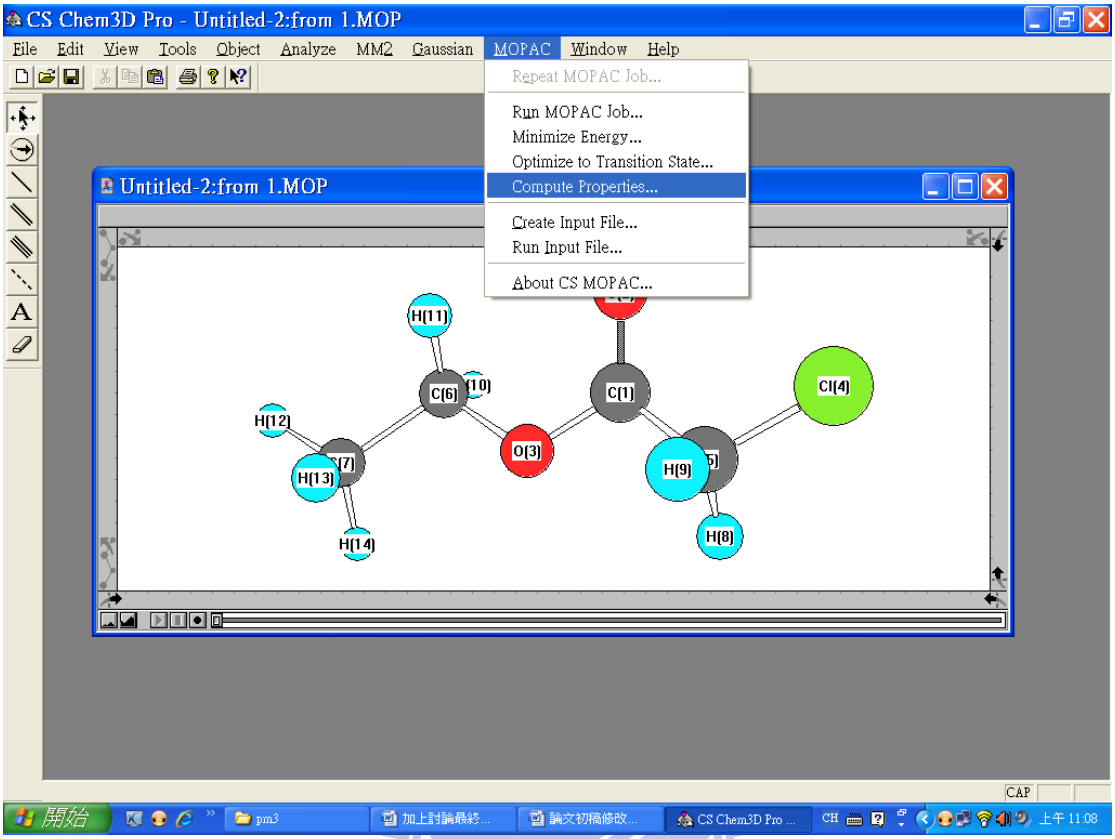
View→Settings→依下列圖示設定



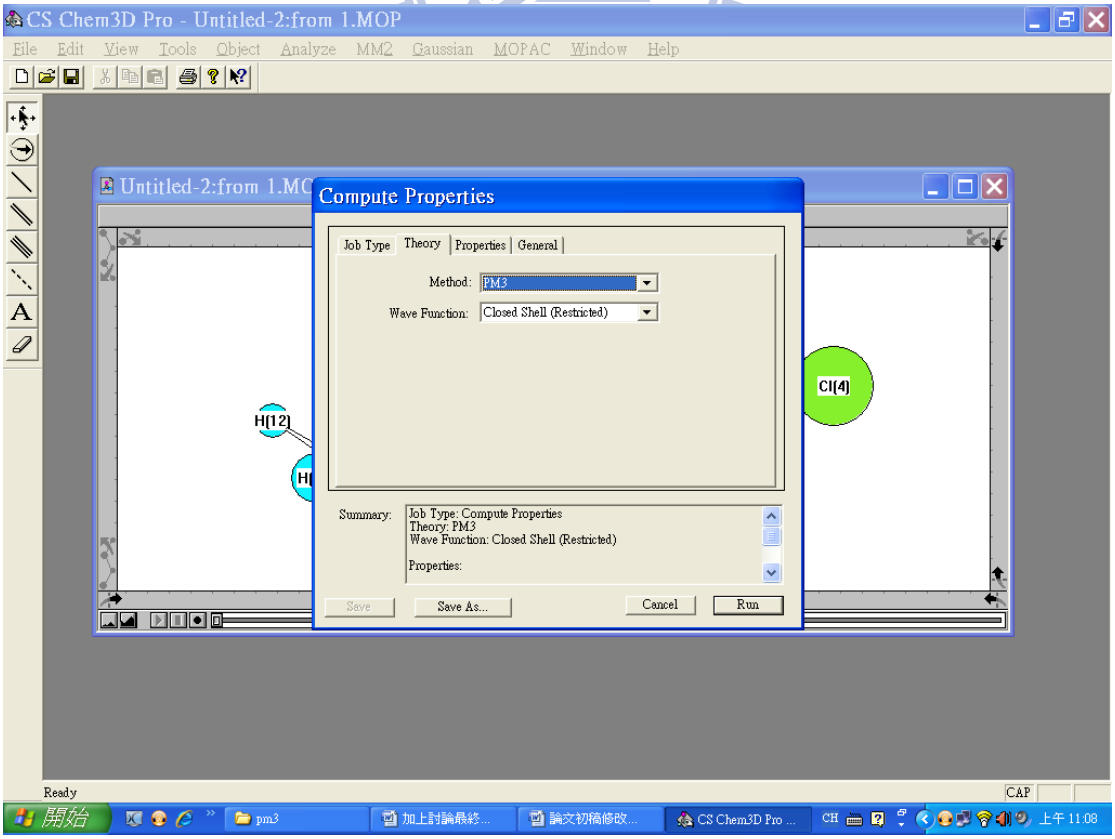

CS Chem3D Pro - Untitled-2:from 1.MOP
File Edit View Tools Object Analyze MM2 Gaussian MOPAC Window Help
Untitled-2:from 1.MOP
O(2)
H(11)
Cl(4)
H(12)
H(13)
H(14)
Settings
Atom Labels
By Default, Show...
Element Symbols
Serial Numbers
Font: System
Size: 10
Ready
CAP


CS Chem3D Pro - Untitled-2:from 1.MOP
File Edit View Tools Object Analyze MM2 Gaussian MOPAC Window Help
Untitled-2:from 1.MOP
O(2)
H(11)
Cl(4)
H(12)
H(13)
H(14)
Settings
Pop-up Information
Show Information While Pointing
Cartesian Coordinates
Atom Type
Z-Matrix
Measurement
Bond Length
Bond Order
Partial Charge
Ready
CAP

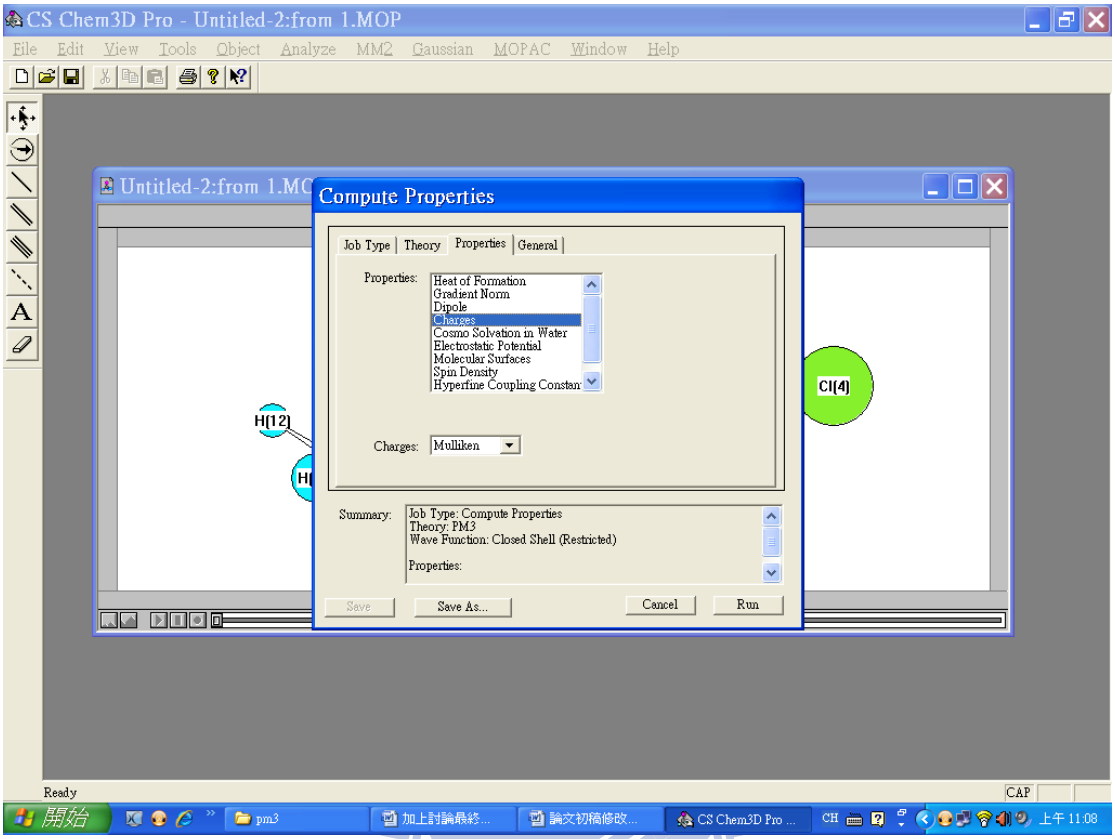
10. 點選 MOPAC→Compute Properties



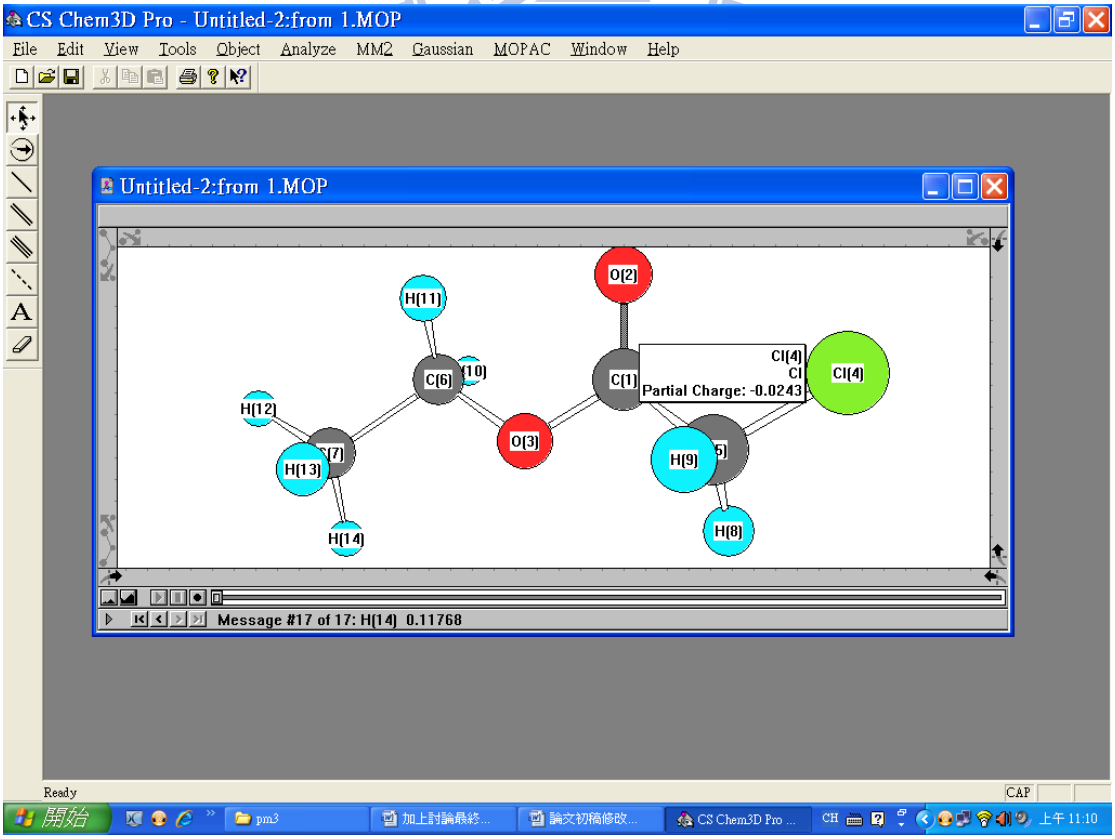
Theory: PM3



僅單選 Charge→Run



游標移至鹵素位置即為 Halo 部分電荷=-0.0243 即可求出



游標移至鍵結鹵素碳位置即為 H-carbon 部分電荷=-0.2922 即可求出