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APPENDICES

APPENDIX A

Table A-1 Effect of H_2O_2 concentration on low concentration of aniline and nitrobenzene ([aniline and nitrobenzene] = 1 mM, Fe^{2+} = 0.5 mM, pH = 3 and H_2O_2 = free H_2O_2)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.00	1.00	1.00	-
2	3.00	0.98	0.98	-
5	3.00	0.97	0.99	-
10	3.01	0.96	0.99	-
20	3.01	0.95	0.95	-
40	3.02	0.96	0.94	-
60	3.02	0.94	0.96	-
80	3.03	0.95	0.94	-

Table A-2 Effect of H_2O_2 concentration on low concentration of aniline and nitrobenzene ([aniline and nitrobenzene] = 1 mM, Fe^{2+} = 0.5 mM, pH = 3 and H_2O_2 = 5 mM)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3	1.00	1.00	1.0
2	2.93	0.66	0.68	0.58
5	2.88	0.55	0.49	0.43
10	2.83	0.43	0.34	0.16
20	2.79	0.39	0.32	0
40	2.78	0.36	0.31	0
60	2.77	0.35	0.30	0
80	2.77	0.34	0.29	0

Table A-3 Effect of H_2O_2 concentration on low concentration of aniline and nitrobenzene ([aniline and nitrobenzene] = 1 mM, Fe^{2+} = 0.5 mM, pH = 3 and H_2O_2 = 7.5 mM)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.00	1.00	1.00	1.00
2	2.84	0.70	0.58	0.66
5	2.71	0.32	0.19	0.35
10	2.65	0.27	0.15	0.11
20	2.62	0.22	0.14	0.04
40	2.62	0.22	0.15	0
60	2.61	0.20	0.20	0
80	2.60	0.23	0.19	0

Table A-4 Effect of H_2O_2 concentration on low concentration of aniline and nitrobenzene ([aniline and nitrobenzene] = 1 mM, Fe^{2+} = 0.5 mM, pH = 3 and H_2O_2 = 15 mM)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.00	1.00	1.00	1.00
2	2.79	0.50	0.47	0.75
5	2.67	0.21	0.13	0.47
10	2.60	0.15	0.05	0.37
20	2.54	0.15	0.04	0.25
40	2.48	0.12	0.04	0.08
60	2.45	0.12	0.05	0.03
80	2.44	0.08	0.05	0

Table A-5 Effect of H_2O_2 concentration on low concentration of aniline and nitrobenzene ([aniline and nitrobenzene] = 1 mM, Fe^{2+} = 0.5 mM, pH = 3 and H_2O_2 = 20 mM)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.00	1.00	1.00	1.00
2	2.75	0.44	0.39	0.78
5	2.65	0.17	0.09	0.54
10	2.60	0.11	0.03	0.43
20	2.52	0.08	0.03	0.29
40	2.43	0.05	0.02	0.15
60	2.39	0.04	0.02	0.10
80	2.36	0.04	0.02	0.09

Table A-6 Effect of H_2O_2 concentration on low concentration of aniline and nitrobenzene ([aniline and nitrobenzene] = 1 mM, Fe^{2+} = 0.5 mM, pH = 3 and H_2O_2 = 25 mM)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.00	1.00	1.00	1.00
2	2.61	0.45	0.42	0.83
5	2.50	0.19	0.11	0.62
10	2.46	0.08	0.06	0.52
20	2.42	0.06	0.03	0.41
40	2.38	0.05	0.02	0.32
60	2.36	0.04	0.02	0.25
80	2.33	0.04	0.03	0.22

Table A-7 Effect of Fe^{2+} concentration on low concentration of aniline and nitrobenzene ([aniline and nitrobenzene] = 1 mM, H_2O_2 = 25 mM, pH = 3 and Fe^{2+} = free Fe^{2+})

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.00	1.00	1.00	1.00
2	2.89	0.90	0.90	0.93
5	2.90	0.88	0.89	0.92
10	3.00	0.86	0.87	0.91
20	3.00	0.86	0.83	0.87
40	3.01	0.84	0.82	0.84
60	3.02	0.76	0.74	0.84
80	3.03	0.73	0.66	0.83

Table A-8 Effect of Fe^{2+} concentration on low concentration of aniline and nitrobenzene ([aniline and nitrobenzene] = 1 mM, H_2O_2 = 25 mM, pH = 3 and Fe^{2+} = 0.1 mM)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.00	1.00	1.00	1.00
2	2.96	0.81	0.82	0.93
5	2.94	0.79	0.78	0.91
10	2.92	0.77	0.77	0.89
20	2.89	0.61	0.59	0.87
40	2.84	0.35	0.27	0.69
60	2.67	0.25	0.15	0.59
80	2.61	0.2	0.12	0.53

Table A-9 Effect of Fe^{2+} concentration on low concentration of aniline and nitrobenzene ([aniline and nitrobenzene] = 1 mM, H_2O_2 = 25 mM, pH = 3 and Fe^{2+} = 0.25 mM)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.00	1.00	1.00	1.00
2	2.89	0.78	0.81	0.91
5	2.70	0.50	0.48	0.73
10	2.62	0.25	0.14	0.58
20	2.52	0.12	0.05	0.38
40	2.48	0.08	0.04	0.30
60	2.46	0.08	0.04	0.28
80	2.46	0.06	0.04	0.23

Table A-10 Effect of Fe^{2+} concentration on low concentration of aniline and nitrobenzene ([aniline and nitrobenzene] = 1 mM, H_2O_2 = 25 mM, pH = 3 and Fe^{2+} = 0.5 mM)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.00	1.00	1.00	1.00
2	2.75	0.44	0.38	0.78
5	2.65	0.17	0.09	0.54
10	2.60	0.11	0.03	0.43
20	2.52	0.08	0.02	0.29
40	2.43	0.05	0.02	0.15
60	2.39	0.04	0.02	0.10
80	2.36	0.04	0.02	0.09

Table A-11 Effect of Fe^{2+} concentration on low concentration of aniline and nitrobenzene ([aniline and nitrobenzene] = 1 mM, H_2O_2 = 25 mM, pH = 3 and Fe^{2+} = 1 mM)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.00	1.00	1.00	1.00
2	2.61	0.21	0.09	0.50
5	2.51	0.09	0.02	0.28
10	2.46	0.07	0.02	0.13
20	2.40	0.05	0.02	0.02
40	2.37	0.04	0.02	0
60	2.36	0.04	0.02	0
80	2.35	0.03	0.02	0

Table A-12 Effect of Fe^{2+} concentration on low concentration of aniline and nitrobenzene ([aniline and nitrobenzene] = 1 mM, H_2O_2 = 25 mM, pH = 3 and Fe^{2+} = 2.5 mM)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.00	1.00	1	1
2	2.46	0.04	0.01	0.22
5	2.37	0.03	0.01	0.03
10	2.35	0.01	0.01	0
20	2.33	0.01	0.01	0
40	2.32	0.01	0.01	0
60	2.31	0.01	0.01	0
80	2.30	0.01	0	0

Table A-13 Effect of pH on degradation of aniline and nitrobenzene ([aniline and nitrobenzene] = 1 mM, H_2O_2 = 20 mM, Fe^{2+} = 0.5 mM and pH = 2.7)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	2.70	1.00	1.00	1.00
2	2.67	0.87	0.88	0.88
5	2.62	0.69	0.67	0.84
10	2.54	0.32	0.18	0.61
20	2.42	0.13	0.04	0.43
40	2.36	0.10	0.04	0.27
60	2.33	0.09	0.04	0.18
80	2.32	0.10	0.04	0.09

Table A-14 Effect of pH on degradation of aniline and nitrobenzene ([aniline and nitrobenzene] = 1 mM, H_2O_2 = 20 mM, Fe^{2+} = 0.5 mM and pH = 3.0)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.00	1.00	1.00	1.00
2	2.75	0.44	0.38	0.78
5	2.65	0.17	0.09	0.54
10	2.60	0.11	0.03	0.43
20	2.52	0.08	0.02	0.29
40	2.43	0.05	0.02	0.15
60	2.39	0.04	0.02	0.10
80	2.36	0.04	0.02	0.09

Table A-15 Effect of pH on degradation of aniline and nitrobenzene ([aniline and nitrobenzene] = 1 mM, H_2O_2 = 20 mM, Fe^{2+} = 0.5 mM and pH = 3.5)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.50	1.00	1.00	1.00
2	3.07	0.73	0.68	0.74
5	2.90	0.42	0.33	0.61
10	2.81	0.19	0.11	0.48
20	2.69	0.09	0.06	0.35
40	2.58	0.07	0.06	0.16
60	2.51	0.07	0.05	0.10
80	2.49	0.07	0.05	0.08

Table A-16 Effect of pH on degradation of aniline and nitrobenzene ([aniline and nitrobenzene] = 1 mM, H_2O_2 = 20 mM, Fe^{2+} = 0.5 mM and pH = 4.0)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	4.00	1.00	1.00	1.00
2	3.10	0.61	0.70	0.81
5	2.98	0.47	0.49	0.73
10	2.85	0.24	0.15	0.53
20	2.75	0.12	0.06	0.42
40	2.61	0.06	0.04	0.19
60	2.45	0.04	0.04	0.12
80	2.51	0.04	0.03	0.06

Table A-17 Effect of Fe^{2+} on high concentration of aniline and nitrobenzene ([aniline and nitrobenzene] = 10 mM, H_2O_2 = 75 mM, pH = 3.0 and Fe^{2+} = 0.5 mM)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	2.96	1.00	1.00	1.00
2	2.86	0.91	0.98	0.92
5	2.82	0.91	0.96	0.90
10	2.80	0.88	0.83	0.89
20	2.77	0.84	0.82	0.88
40	2.73	0.87	0.81	0.83
60	2.69	0.83	0.78	0.83
80	2.65	0.81	0.78	0.80

Table A-18 Effect of Fe^{2+} on high concentration of aniline and nitrobenzene ([aniline and nitrobenzene] = 10 mM, H_2O_2 = 75 mM, pH = 3.0 and Fe^{2+} = 0.6667 mM)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	2.99	1.00	1.00	1.00
2	2.82	0.89	0.93	0.87
5	2.77	0.88	0.90	0.86
10	2.73	0.88	0.89	0.84
20	2.67	0.82	0.76	0.82
40	2.56	0.77	0.75	0.78
60	2.46	0.62	0.60	0.73
80	2.34	0.45	0.45	0.69

Table A-19 Effect of Fe^{2+} on high concentration of aniline and nitrobenzene ([aniline and nitrobenzene] = 10 mM, H_2O_2 = 75 mM, pH = 3.0 and Fe^{2+} = 1 mM)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.00	1.00	1.00	1.00
2	2.72	0.83	0.81	0.80
5	2.58	0.67	0.63	0.75
10	2.37	0.45	0.43	0.67
20	2.21	0.27	0.21	0.48
40	2.13	0.18	0.12	0.34
60	2.09	0.16	0.12	0.28
80	2.08	0.15	0.11	0.24

Table A-20 Effect of Fe^{2+} on high concentration of aniline and nitrobenzene ([aniline and nitrobenzene] = 10 mM, H_2O_2 = 75 mM, pH = 3.0 and Fe^{2+} = 1.25 mM)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.00	1.00	1.00	1.00
2	2.69	0.83	0.77	0.79
5	2.56	0.63	0.58	0.67
10	2.31	0.44	0.35	0.52
20	2.18	0.23	0.16	0.31
40	2.12	0.16	0.09	0.18
60	2.09	0.14	0.09	0.12
80	2.08	0.11	0.09	0.07

Table A-21 Effect of Fe^{2+} on high concentration of aniline and nitrobenzene ([aniline and nitrobenzene] = 10 mM, H_2O_2 = 75 mM, pH = 3.0 and Fe^{2+} = 1.875 mM)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.01	1.00	1.00	1.00
2	2.41	0.38	0.55	0.52
5	2.21	0.19	0.19	0.35
10	2.12	0.13	0.09	0.20
20	2.06	0.09	0.07	0.08
40	2.03	0.07	0.07	0.01
60	2.02	0.06	0.07	0
80	2.02	0.07	0.07	0

Table A-22 Effect of Fe^{2+} on high concentration of aniline and nitrobenzene ([aniline and nitrobenzene] = 10 mM, H_2O_2 = 75 mM, pH = 3.0 and Fe^{2+} = 2.5 mM)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.03	1.00	1.00	1.00
2	2.10	0.14	0.17	0.27
5	1.73	0.07	0.05	0.11
10	1.68	0.04	0.05	0.01
20	1.69	0.04	0.05	0
40	1.70	0.04	0.05	0
60	1.70	0.04	0.05	0
80	1.69	0.05	0.05	0

Table A-23 Effect of H_2O_2 on high concentration of aniline and nitrobenzene ([aniline and nitrobenzene] = 10 mM, Fe^{2+} = 1.875 mM, pH = 3.0 and H_2O_2 = 50 mM)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	2.95	1.00	1.00	1.00
2	2.48	0.59	0.82	0.57
5	2.31	0.34	0.42	0.32
10	2.17	0.22	0.21	0.09
20	2.12	0.16	0.16	.0.01
40	2.12	0.15	0.20	0
60	2.12	0.15	0.22	0
80	2.11	0.12	0.20	0

Table A-24 Effect of H_2O_2 on high concentration of aniline and nitrobenzene ([aniline and nitrobenzene] = 10 mM, Fe^{2+} = 1.875 mM, pH = 3.0 and H_2O_2 = 60 mM)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	2.96	1.00	1.00	1.00
2	2.54	0.58	0.82	0.64
5	2.31	0.30	0.37	0.37
10	2.16	0.17	0.16	0.16
20	2.09	0.12	0.10	0.09
40	2.07	0.11	0.11	0
60	2.07	0.10	0.11	0
80	2.06	0.10	0.11	0

Table A-25 Effect of H_2O_2 on high concentration of aniline and nitrobenzene ([aniline and nitrobenzene] = 10 mM, Fe^{2+} = 1.875 mM, pH = 3.0 and H_2O_2 = 75 mM)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.01	1.00	1.00	1.00
2	2.41	0.41	0.57	0.52
5	2.21	0.20	0.19	0.35
10	2.12	0.13	0.09	0.20
20	2.06	0.09	0.07	0.08
40	2.03	0.07	0.07	0.01
60	2.02	0.06	0.08	0
80	2.02	0.07	0.08	0

Table A-26 Effect of H_2O_2 on high concentration of aniline and nitrobenzene ([aniline and nitrobenzene] = 10 mM, Fe^{2+} = 1.875 mM, pH = 3.0 and H_2O_2 = 100 mM)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	2.99	1.00	1.00	1.00
2	2.41	0.38	0.54	0.61
5	2.18	0.19	0.18	0.42
10	2.08	0.11	0.08	0.29
20	2.03	0.07	0.05	0.17
40	1.99	0.06	0.05	0.07
60	1.97	0.04	0.04	0.01
80	1.95	0.05	0.05	0

Table A-27 Effect of H_2O_2 on high concentration of aniline and nitrobenzene ([aniline and nitrobenzene] = 10 mM, Fe^{2+} = 1.875 mM, pH = 3.0 and H_2O_2 = 150 mM)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.00	1.00	1.00	1.00
2	2.32	0.24	0.35	0.63
5	2.13	0.11	0.11	0.52
10	2.08	0.08	0.07	0.43
20	2.02	0.06	0.06	0.34
40	1.95	0.06	0.05	0.25
60	1.92	0.05	0.04	0.20
80	1.90	0.02	0.04	0.17

Table A-28 Competitive degradation behavior (Fe^{2+} = 1.25 mM, pH = 3.0 and H_2O_2 = 67.5 mM and aniline/nitrobenzene = free nitrobenzene)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.01	1.00	-	1.00
2	2.58	0.71	-	0.75
5	2.48	0.58	-	0.69
10	2.39	0.49	-	0.64
20	2.35	0.43	-	0.60
40	2.31	0.37	-	0.58
60	2.27	0.34	-	0.56
80	2.25	0.32	-	0.57

Table A-29 Competitive degradation behavior (Fe^{2+} = 1.25 mM, pH = 3.0 and H_2O_2 = 67.5 mM and aniline/nitrobenzene = free aniline)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	2.99	-	1.00	1.00
2	2.82	-	0.96	0.80
5	2.65	-	0.60	0.65
10	2.35	-	0.19	0.41
20	2.19	-	0.07	0.15
40	2.12	-	0.07	0.01
60	2.11	-	0.07	0
80	2.10	-	0.07	0

Table A-30 Competitive degradation behavior (Fe^{2+} = 1.25 mM, pH = 3.0 and H_2O_2 = 67.5 mM and aniline/nitrobenzene = 10/1)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.00	1.00	1.00	1.00
2	2.64	0.55	0.99	0.69
5	2.52	0.52	0.99	0.60
10	2.43	0.44	0.99	0.57
20	2.37	0.37	0.96	0.54
40	2.32	0.35	0.83	0.53
60	2.29	0.33	0.79	0.51
80	2.27	0.32	0.75	0.51

Table A-31 Competitive degradation behavior (Fe^{2+} = 1.25 mM, pH = 3.0 and H_2O_2 = 67.5 mM and aniline/nitrobenzene = 5/1)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.02	1.00	1.00	1.00
2	2.66	0.65	0.98	0.75
5	2.51	0.54	0.90	0.65
10	2.40	0.43	0.76	0.59
20	2.33	0.31	0.54	0.54
40	2.27	0.27	0.45	0.49
60	2.24	0.23	0.37	0.44
80	2.23	0.20	0.32	0.43

Table A-32 Competitive degradation behavior (Fe^{2+} = 1.25 mM, pH = 3.0 and H_2O_2 = 67.5 mM and aniline/nitrobenzene = 2/1)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.01	1.00	1.00	1.00
2	2.66	0.64	0.95	0.74
5	2.46	0.41	0.70	0.59
10	2.31	0.22	0.29	0.44
20	2.22	0.16	0.18	0.34
40	2.17	0.13	0.16	0.23
60	2.15	0.11	0.15	0.17
80	2.13	0.11	0.11	0.13

Table A-33 Competitive degradation behavior (Fe^{2+} = 1.25 mM, pH = 3.0 and H_2O_2 = 67.5 mM and aniline/nitrobenzene = 1/1)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	2.99	1.00	1.00	1.00
2	2.59	0.56	0.91	0.71
5	2.35	0.31	0.37	0.53
10	2.21	0.20	0.16	0.35
20	2.15	0.13	0.09	0.22
40	2.10	0.10	0.07	0.12
60	2.07	0.09	0.06	0.05
80	2.06	0.07	0.06	0.02

Table A-34 Competitive degradation behavior (Fe^{2+} = 1.25 mM, pH = 3.0 and H_2O_2 = 67.5 mM and aniline/nitrobenzene = 1/2)

Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.00	1.00	1.00	1.00
2	2.77	0.65	0.95	0.71
5	2.48	0.32	0.46	0.51
10	2.27	0.16	0.12	0.28
20	2.19	0.10	0.08	0.13
40	2.14	0.08	0.06	0.02
60	2.12	0.08	0.07	0
80	2.12	0.08	0.06	0

Table A-35 Competitive degradation behavior (Fe^{2+} = 1.25 mM, pH = 3.0 and H_2O_2 = 67.5 mM and aniline/nitrobenzene = 1/5)

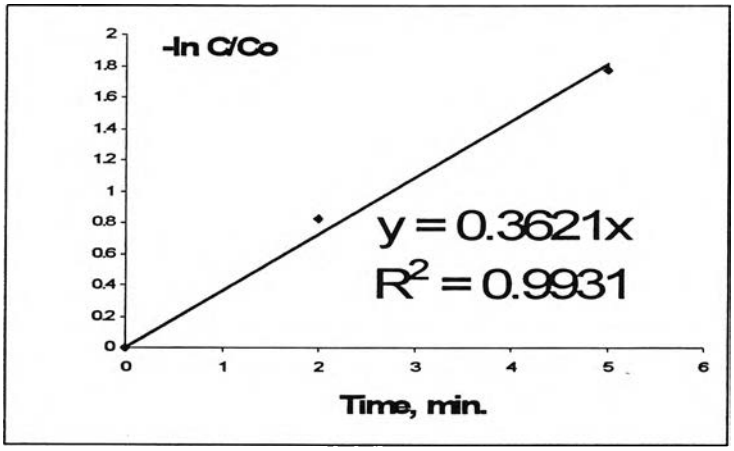
Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.00	1.00	1.00	1.00
2	2.74	0.63	0.87	0.73
5	2.40	0.25	0.22	0.45
10	2.25	0.12	0.08	0.28
20	2.17	0.09	0.06	0.12
40	2.12	0.08	0.07	0.03
60	2.10	0.09	0.07	0
80	2.09	0.08	0.07	0

Table A-36 Competitive degradation behavior (Fe^{2+} = 1.25 mM, pH = 3.0 and H_2O_2 = 67.5 mM and aniline/nitrobenzene = 1/10)

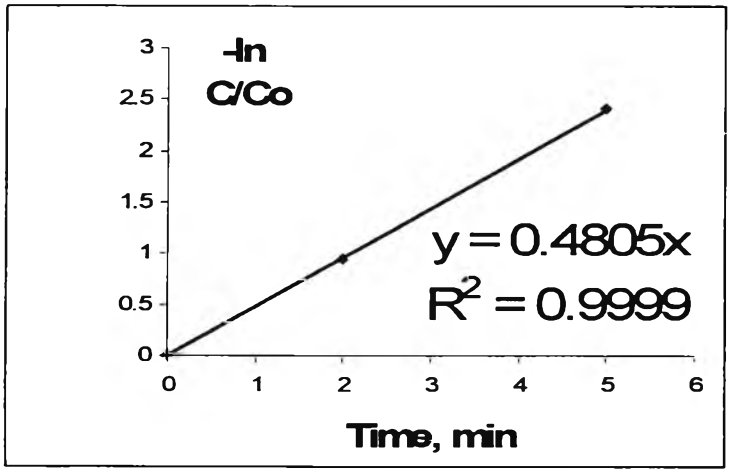
Time, min	pH	Residual Fraction C/Co		
		aniline	nitrobenzene	H_2O_2
0	3.01	1.00	1.00	1.00
2	2.84	0.68	0.93	0.74
5	2.52	0.29	0.31	0.49
10	2.31	0.16	0.08	0.26
20	2.22	0.13	0.07	0.09
40	2.17	0.13	0.07	0
60	2.17	0.08	0.07	0
80	2.17	0.09	0.06	0

Table A-37 Effect of Fe^{2+} concentration on low concentration of aniline and nitrobenzene kinetic results ([aniline and nitrobenzene] = 1 mM, H_2O_2 = 0.5 mM, pH = 3 and Fe^{2+} = 0.05 mM)

Time	Aniline		Nitrobenzene	
	C/Co	-ln c/co	C/Co	-ln c/co
0	1	0	1	0
2	0.44	0.82098	0.388	0.94675
5	0.17	1.77196	0.09	2.40795
10	0.11	2.20727	0.034	3.38139
20	0.08	2.52573	0.028	3.57555
40	0.05	2.99573	0.022	3.81671
60	0.04	3.21888	0.023	3.77226
80	0.046	3.07911	0.023	3.77226



Aniline



Nitrobenzene

Figure A-1 –ln C/Co of aniline and nitrobenzene

Calculation

$$r = kC$$

r = initial rate (M/min)

k' = rate constant (min^{-1})

C = concentration of aniline or nitrobenzene (M)

For aniline

$$r = 0.3621\ min^{-1} \times 10^{-3}\ M$$
$$= 0.3621\ mM \cdot min^{-1}$$

For nitrobenzene

$$r = 0.4805\ min^{-1} \times 10^{-3}\ M$$
$$= 0.4805\ mM \cdot min^{-1}$$

APPENDIX B

Standard Iodometric method (Kingzett, C.T., 1880)

Reagents

1. Potassium iodide solution (1%w/v KI). Dissolve 1.0 grams KI into 100 ml of RO water.
2. Ammonium molybdate solution. Dissolve 9 grams ammonium molybdate in 10 ml 6 N NH_4OH, add 24 grams NH_4NO_3 and dilute to 100 ml with OR water.
3. Sulfuric acid solution (1:4 H_2SO_4). Carefully add one part H_2SO_4 98 % to four parts RO water.
4. Starch indicator
5. Sodium thiosulfate (0.025 N Na_2SO_3. 5 H_2O) solution

Procedure

1. Sample was transfer to 250 ml Erlemeyer flask.
2. Adding RO water to the Erlenmeyer flask until 50 ml. Next, 10ml of 1:4 sulfuric acid solution and 15 ml of 1% w/v of potassium iodide were added. Then 2 drops of ammonium molybdate was added.
3. Titrate with 0.025 N of sodium thiosulfate to faint yellow or straw color. Swirl or stir gentry during titration to minimize iodine loss.
4. Add about 2 ml starch indicator, and continue titration until the blue color just disappear.
5. Repeat steps 2-4 on a blank sample of water.
6. Note ml of 0.025 $Na_2SO_3.5H_2O$ for samples and blanks analysis.

Standardize

1. weight out 2 grams of KI and transfer to 250 ml Erlenmeyer flask. Add RO water to 100 ml
2. Then, 10 ml of 0.025 N of $K_2Cr_2O_7$ and 10 ml of 1+ 9 H_2SO_4 were added. After that, keep the Erlenmeyer flask in dark place for 5 minutes.
3. Add RO water to the Erlenmeyer flask until 200 ml.
4. Tritrate with 0.025 N of sodium thiosulfate. And follow the procedure steps 3-4 as describe earlier.
5. Note ml of 0.025 $Na_2SO_3.5H_2O$ for standardize analysis.

Calculation

$$H_2O_2 \text{ (mg/l)} = \frac{\text{(A-B) x (Normality of } Na_2SO_3\text{) x 17 x 1,000}}{\text{ml of sample}}$$

A = ml of Na_2SO_3 for sample

B = ml of Na_2SO_3 for blank

$$\text{N = Normality of } Na_2SO_3 = \frac{10 \times 0.025}{\text{ml of } Na_2SO_3 \text{ for standardize}}$$

BIOGHAPHY

Mr. Nara Toyam was born on March 25, 1981 in Bangkok, Thailand. He received her Bachelor's degree in Degree in Environmental Engineering form Faculty of Engineering, King Mongkut's University of Technology Thonburi 2003. He pursued her Master Degree studies in the International Postgraduate Program in Environmental Management (Hazardous Waste Management), Inter-Department of Environmental Management Chulalongkorn University, Bangkok, Thailand on May, 2003. He had a publication with his advisor, Asst. Prof. Puangrat Kajitvichyanukul in the subject of "Effect of Organic and Inorganic Ions on Chromium (VI) Adsorption onto TiO_2 Surface", ASEAN Journal on Science&Technology for Development, Vol. 21, Nos. 2&3, 249-258 (2004).