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Appendices

Appendix A
Control Experiment (Adsorption)

Table A.1 Comparison of different carriers,
control experiments in fluidized-bed reactor (adsorption).

Table A.1a Control experiments in fluidized-bed reactor (Al_2O_3).

Time(min)	Color remaining(C/C_0)			COD remaining (C/C_0)		
	RB5	RO16	RB2	RB5	RO16	RB2
0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0	0.4970	0.7830	0.4350	0.6081	0.9206	0.6000
2	0.3570	0.7860	0.3850	0.5135	0.9206	0.6000
5	0.2750	0.7840	0.3580	0.5000	0.8730	0.5625
10	0.2190	0.7810	0.3540	0.4865	0.8889	0.5400
25	0.1470	0.7810	0.2760	0.4865	0.9206	0.5375
50	0.1250	0.7960	0.2380	0.4324	0.9683	0.4750
100	0.1120	0.8440	0.1660	0.3243	0.9841	0.4375

reactive dyes = 0.1 mM, Al_2O_3 = 74.07 g/l and initial pH = 3.0

Table A.1b Control experiments in fluidized-bed reactor; (SiO_2)

Time(min)	Color remaining (C/C_0)			COD remaining (C/C_0)		
	RB5	RO16	RB2	RB5	RO16	RB2
0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.9970	1.0000	1.0030	1.0000	0.9825	1.0072
5	0.9990	1.0000	0.9960	0.9861	0.9649	1.0000
10	1.0000	1.0010	0.9960	0.9931	0.9561	1.0000
25	1.0010	1.0040	0.9940	0.9861	0.9298	0.9565
50	1.0040	0.9950	0.9880	0.9583	0.9298	0.9565
100	0.9950	0.9910	0.9870	0.9306	0.9474	0.9420

reactive dyes = 0.1 mM, SiO_2 = 74.07 g/l and initial pH = 3.0

Appendix B

Comparison of different carriers on the reactive dyes degradation

Table B.1 Comparison of different carriers on the reactive black 5 degradation.

Time(min)	Color remaining(C/C ₀)		COD remaining(C/C ₀)		H ₂ O ₂ remaining(C/C ₀)	
	SiO ₂	Al ₂ O ₃	SiO ₂	Al ₂ O ₃	SiO ₂	Al ₂ O ₃
0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0	1.0000	0.4810	1.0000	0.6723	1.0000	1.0000
2	0.0300	0.1320	0.6442	0.5528	0.4680	0.6690
5	0.0190	0.0940	0.5183	0.5308	0.3130	0.4780
10	0.0160	0.0660	0.4455	0.5215	0.2760	0.4200
25	0.0140	0.0330	0.3263	0.4482	0.1380	0.2920
50	0.0140	0.0210	0.1941	0.3647	0.1170	0.2390
100	0.0130	0.0170	0.0881	0.3423	0.0000	0.1910

RB5=0.1 mM, Fe²⁺=20 mg/l, H₂O₂=160 mg/l, carrier=74.07 g/l, initial pH = 3

Table B.2 Comparison of different carriers on the reactive orange 16 degradation.

Time(min)	Color remaining(C/C ₀)		COD remaining(C/C ₀)		H ₂ O ₂ remaining(C/C ₀)	
	SiO ₂	Al ₂ O ₃	SiO ₂	Al ₂ O ₃	SiO ₂	Al ₂ O ₃
0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0	1.0000	0.8100	1.0000	1.0000	1.0000	1.0000
2	0.0660	0.0620	0.9179	0.7233	0.7280	0.7380
5	0.0180	0.0170	0.8106	0.6557	0.5530	0.5630
10	0.0140	0.0100	0.7526	0.6211	0.4300	0.5310
25	0.0100	0.0040	0.6449	0.5929	0.3130	0.3290
50	0.0100	0.0020	0.5787	0.5249	0.2550	0.2870
100	0.0110	0.0010	0.3368	0.4319	0.2130	0.2390

RO16=0.1 mM, Fe²⁺=10 mg/l, H₂O₂=160 mg/l, carrier=74.07 g/l, initial pH = 3

Table B.3 Comparison of different carriers on the reactive blue 2 degradation.

Time(min)	Color remaining(C/C ₀)		COD remaining(C/C ₀)		H ₂ O ₂ remaining(C/C ₀)	
	SiO ₂	Al ₂ O ₃	SiO ₂	Al ₂ O ₃	SiO ₂	Al ₂ O ₃
0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
0	1.0000	0.6150	1.0000	0.5761	1.0000	1.0000
2	0.3830	0.2920	0.9698	0.4925	0.7920	0.6960
5	0.2280	0.2630	0.8007	0.4465	0.5630	0.6160
10	0.1510	0.2550	0.6234	0.4137	0.4730	0.5680
25	0.0460	0.2100	0.4023	0.4070	0.3290	0.5100
50	0.0240	0.1980	0.3045	0.4070	0.1430	0.4990
100	0.0200	0.1770	0.2101	0.3938	0.0430	0.4780

RB2=0.1 mM, Fe²⁺=15 mg/l, H₂O₂=160 mg/l, carrier=74.07 g/l, initial pH = 3

Appendix C
Effect of Fe^{2+} concentration on COD removal of reactive dyes

Table C.1 Effect of Fe^{2+} concentration on COD removal of RB5.

Time(min)	COD remaining(C/C_0)				
	5mg/ Fe^{2+}	10mg/ Fe^{2+}	15mg/ Fe^{2+}	20mg/ Fe^{2+}	25mg/ Fe^{2+}
0	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.8120	0.8430	0.7366	0.6442	0.5627
5	0.7481	0.7764	0.5622	0.5183	0.5072
10	0.6679	0.6388	0.4639	0.4455	0.3980
25	0.4918	0.4533	0.3823	0.3263	0.2545
50	0.3919	0.3641	0.2581	0.1941	0.1116
100	0.3219	0.2581	0.2188	0.0881	0.0435

RB5 = 0.1 mM, H_2O_2 = 160 mg/l, carrier = 74.07 g/l, initial pH = 3

Table C.1 Effect of Fe^{2+} concentration on COD removal of RB5 (continued).

Time(min)	color remaining(C/C_0) -				
	5mg/ Fe^{2+}	10mg/ Fe^{2+}	15mg/ Fe^{2+}	20mg/ Fe^{2+}	25mg/ Fe^{2+}
0	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.1190	0.0600	0.0400	0.0300	0.0290
5	0.0440	0.0220	0.0220	0.0190	0.0210
10	0.0220	0.0150	0.0180	0.0160	0.0190
25	0.0100	0.0100	0.0150	0.0140	0.0170
50	0.0060	0.0120	0.0140	0.0140	0.0160
100	0.0070	0.0130	0.0140	0.0130	0.0160

RB5 = 0.1 mM, H_2O_2 = 160 mg/l, carrier = 74.07 g/l, initial pH = 3

Table C.1 Effect of Fe^{2+} concentration on COD removal of RB5 (continued).

Time(min)	H_2O_2 remaining(C/C_0)				
	5mg/ Fe^{2+}	10mg/ Fe^{2+}	15mg/ Fe^{2+}	20mg/ Fe^{2+}	25mg/ Fe^{2+}
0	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.7650	0.6000	0.5840	0.4680	0.3670
5	0.6220	0.5500	0.5050	0.3130	0.2500
10	0.5900	0.4000	0.3800	0.2760	0.1970
25	0.5000	0.3080	0.2660	0.1800	0.1060
50	0.4250	0.2300	0.1500	0.1170	0.0690
100	0.2980	0.1750	0.0690	0.0000	0.0000

RB5 = 0.1 mM, H_2O_2 = 160 mg/l, carrier = 74.07 g/l, initial pH = 3

Table C.2 Effect of Fe^{2+} concentration on COD removal of RO16.

Time(min)	COD remaining(C/C_0)				
	5mg/ Fe^{2+}	10mg/ Fe^{2+}	15mg/ Fe^{2+}	20mg/ Fe^{2+}	25mg/ Fe^{2+}
0	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.9377	0.9179	0.7983	0.7776	0.5754
5	0.9191	0.8106	0.7785	0.6370	0.5522
10	0.8246	0.7526	0.6954	0.5581	0.4671
25	0.7000	0.6449	0.5947	0.4856	0.2457
50	0.5909	0.5787	0.4948	0.4247	0.1847
100	0.4114	0.3368	0.2883	0.2596	0.1327

RO16 = 0.1 mM, H_2O_2 = 160 mg/l, carrier = 74.07 g/l, initial pH = 3

Table C.2 Effect of Fe^{2+} concentration on COD removal of RO16 (continued).

Time(min)	color remaining(C/C_0) -				
	5mg/ Fe^{2+}	10mg/ Fe^{2+}	15mg/ Fe^{2+}	20mg/ Fe^{2+}	25mg/ Fe^{2+}
0	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.1980	0.0660	0.0390	0.0370	0.0310
5	0.0590	0.0180	0.0190	0.0230	0.0240
10	0.0270	0.0140	0.0150	0.0190	0.0230
25	0.0150	0.0100	0.0120	0.0170	0.0210
50	0.0070	0.0100	0.0110	0.0160	0.0200
100	0.0060	0.0110	0.0100	0.0160	0.0200

RO16 = 0.1 mM, H_2O_2 = 160 mg/l, carrier = 74.07 g/l, initial pH = 3

Table C.2 Effect of Fe^{2+} concentration on COD removal of RO16 (continued).

Time(min)	H_2O_2 remaining(C/C_0)				
	5mg/ Fe^{2+}	10mg/ Fe^{2+}	15mg/ Fe^{2+}	20mg/ Fe^{2+}	25mg/ Fe^{2+}
0	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.9190	0.7280	0.6380	0.5530	0.5210
5	0.7700	0.5530	0.4460	0.4090	0.2760
10	0.6530	0.4300	0.3830	0.3400	0.2440
25	0.5580	0.3130	0.2550	0.1700	0.1590
50	0.4730	0.2550	0.1700	0.1220	0.0800
100	0.3190	0.2130	0.0800	0.0530	0.0270

RO16 = 0.1 mM, H_2O_2 = 160 mg/l, carrier = 74.07 g/l, initial pH = 3

Table C.3 Effect of Fe^{2+} concentration on COD removal of RB2 .

Time(min)	COD remaining(C/C_0)				
	5mg/ Fe^{2+}	10mg/ Fe^{2+}	15mg/ Fe^{2+}	20mg/ Fe^{2+}	25mg/ Fe^{2+}
0	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.8547	0.9948	0.9698	0.8842	0.7924
5	0.8017	0.8161	0.8007	0.7322	0.6321
10	0.8056	0.6487	0.6234	0.5684	0.5341
25	0.7427	0.5252	0.4023	0.3886	0.3662
50	0.6450	0.4064	0.3045	0.2267	0.2113
100	0.5506	0.2825	0.2101	0.1827	0.1549

RB2 = 0.1 mM, H_2O_2 = 160 mg/l, carrier = 74.07 g/l, initial pH = 3

Table C.3 Effect of Fe^{2+} concentration on COD removal of RB2 (continued) .

Time(min)	color remaining(C/C_0) -				
	5mg/ Fe^{2+}	10mg/ Fe^{2+}	15mg/ Fe^{2+}	20mg/ Fe^{2+}	25mg/ Fe^{2+}
0	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.6750	0.4630	0.3830	0.3080	0.5510
5	0.4140	0.2650	0.2280	0.1960	0.1290
10	0.2650	0.1810	0.1510	0.1180	0.0890
25	0.1420	0.0730	0.0460	0.0450	0.0470
50	0.0830	0.0320	0.0240	0.0300	0.0360
100	0.0350	0.0240	0.0200	0.0240	0.0320

RB2 = 0.1 mM, H_2O_2 = 160 mg/l, carrier = 74.07 g/l, initial pH = 3

Table C.3 Effect of Fe^{2+} concentration on COD removal of RB2 (continued) .

Time(min)	H_2O_2 remaining(C/C_0)				
	5mg/ Fe^{2+}	10mg/ Fe^{2+}	15mg/ Fe^{2+}	20mg/ Fe^{2+}	25mg/ Fe^{2+}
0	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.8770	0.8180	0.7920	0.6590	0.5260
5	0.8230	0.6530	0.5630	0.4570	0.2760
10	0.7440	0.5680	0.4730	0.3510	0.1810
25	0.5790	0.4730	0.3290	0.1380	0.0000
50	0.5000	0.3190	0.1430	0.0430	0.0000
100	0.3830	0.1000	0.0430	0.0210	0.0000

RB2 = 0.1 mM, H_2O_2 = 160 mg/l, carrier = 74.07 g/l, initial pH = 3

Appendix D

Effect of H_2O_2 concentration on COD removal of reactive dyes

Table D.1 Effect of H₂O₂ concentration on COD removal of RB5.

Time(min)	COD remaining(C/C ₀)				
	130mg/l H ₂ O ₂	160mg/l H ₂ O ₂	190mg/l H ₂ O ₂	220mg/l H ₂ O ₂	250mg/l H ₂ O ₂
0	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.7021	0.6442	0.5865	0.4336	0.5126
5	0.5539	0.5183	0.5167	0.3816	0.4488
10	0.4613	0.4455	0.4356	0.3725	0.4446
25	0.4134	0.3263	0.3242	0.3073	0.4091
50	0.3729	0.1941	0.2490	0.1952	0.3117
100	0.2929	0.0881	0.0378	0.0292	0.1664

RB5 = 0.1 mM, Fe²⁺ = 20 mg/l, carrier = 74.07 g/l, initial pH = 3

Table D.1 Effect of H₂O₂ concentration on COD removal of RB5 (continued).

Time(min)	color remaining(C/C ₀) -				
	130mg/l H ₂ O ₂	160mg/l H ₂ O ₂	190mg/l H ₂ O ₂	220mg/l H ₂ O ₂	250mg/l H ₂ O ₂
0	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.0350	0.0300	0.0310	0.0340	0.0280
5	0.0200	0.0190	0.0190	0.0190	0.0170
10	0.0160	0.0160	0.0160	0.0160	0.0150
25	0.0140	0.0140	0.0130	0.0130	0.0120
50	0.0130	0.0130	0.0130	0.0120	0.0110
100	0.0150	0.0130	0.0120	0.0130	0.0110

RB5 = 0.1 mM, Fe²⁺ = 20 mg/l, carrier = 74.07 g/l, initial pH = 3

Table D.1 Effect of H₂O₂ concentration on COD removal of RB5 (continued).

Time(min)	H ₂ O ₂ remaining(mg/l)				
	130mg/l H ₂ O ₂	160mg/l H ₂ O ₂	190mg/l H ₂ O ₂	220mg/l H ₂ O ₂	250mg/l H ₂ O ₂
0	130.0000	160.0000	190.0000	220.0000	250.0000
2	51.0000	74.8000	111.3500	148.7500	185.3000
5	42.5000	50.1500	74.8000	110.5000	139.4000
10	36.5500	44.2000	63.7500	89.2500	110.5000
25	26.3500	22.1000	42.5000	56.1000	62.9000
50	10.2000	18.7000	20.4000	32.3000	31.4500
100	4.2500	0.0000	12.7500	17.0000	14.4500

RB5 = 0.1 mM, Fe²⁺ = 20 mg/l, carrier = 74.07 g/l, initial pH = 3

Table D.2 Effect of H₂O₂ concentration on COD removal of RO16.

Time(min)	COD remaining(C/C ₀)				
	130mg/l H ₂ O ₂	160mg/l H ₂ O ₂	190mg/l H ₂ O ₂	220mg/l H ₂ O ₂	250mg/l H ₂ O ₂
0	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.5457	0.5754	0.6738	0.5672	0.4274
5	0.5148	0.5522	0.5693	0.5467	0.4151
10	0.4801	0.4671	0.5324	0.5415	0.4130
25	0.2861	0.2457	0.2682	0.4047	0.4076
50	0.2596	0.1847	0.2500	0.2382	0.3004
100	0.2333	0.1327	0.1981	0.2116	0.2424

RO16 = 0.1 mM, Fe²⁺ = 25 mg/l, carrier = 74.07 g/l, initial pH = 3

Table D.2 Effect of H₂O₂ concentration on COD removal of RO16 (continued).

Time(min)	color remaining(C/C ₀) -				
	130mg/l H ₂ O ₂	160mg/l H ₂ O ₂	190mg/l H ₂ O ₂	220mg/l H ₂ O ₂	250mg/l H ₂ O ₂
0	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.0420	0.0310	0.0280	0.0320	0.0320
5	0.0360	0.0240	0.0230	0.0250	0.0250
10	0.0340	0.0230	0.0210	0.0220	0.0220
25	0.0330	0.0210	0.0190	0.0210	0.0220
50	0.0310	0.0200	0.0190	0.0200	0.0200
100	0.0310	0.0200	0.0190	0.0200	0.0200

RO16 = 0.1 mM, Fe²⁺ = 25 mg/l, carrier = 74.07 g/l, initial pH = 3

Table D.2 Effect of H₂O₂ concentration on COD removal of RO16 (continued).

Time(min)	H ₂ O ₂ remaining(mg/l)				
	130mg/l H ₂ O ₂	160mg/l H ₂ O ₂	190mg/l H ₂ O ₂	220mg/l H ₂ O ₂	250mg/l H ₂ O ₂
0	130.00	160.00	190.00	220.00	250.00
2	76.50	83.30	113.90	134.30	170.85
5	39.95	44.20	74.80	102.00	125.80
10	31.45	39.10	49.30	68.00	103.70
25	17.00	25.50	37.40	41.65	45.90
50	7.65	12.75	25.50	25.50	21.25
100	0.00	4.25	8.50	4.25	5.10

RO16 = 0.1 mM, Fe²⁺ = 25 mg/l, carrier = 74.07 g/l, initial pH = 3

Table D.3 Effect of H₂O₂ concentration on COD removal of RB2.

Time(min)	COD remaining(C/C ₀)				
	130mg/l H ₂ O ₂	160mg/l H ₂ O ₂	190mg/l H ₂ O ₂	220mg/l H ₂ O ₂	250mg/l H ₂ O ₂
0	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.9100	0.6258	0.8695	0.8896	0.9162
5	0.8939	0.5743	0.6951	0.8586	0.8727
10	0.7070	0.4262	0.5789	0.6634	0.7236
25	0.5533	0.3312	0.4476	0.5852	0.6349
50	0.4881	0.2267	0.3995	0.4642	0.4929
100	0.3077	0.1827	0.2530	0.3884	0.4545

RB2 = 0.1 mM, Fe²⁺ = 20 mg/l, carrier = 74.07 g/l, initial pH = 3

Table D.3 Effect of H₂O₂ concentration on COD removal of RB2 (continued).

Time(min)	color remaining(C/C ₀)				
	130mg/l H ₂ O ₂	160mg/l H ₂ O ₂	190mg/l H ₂ O ₂	220mg/l H ₂ O ₂	250mg/l H ₂ O ₂
0	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.3660	0.3080	0.3640	0.3430	0.3430
5	0.2700	0.1960	0.2730	0.2480	0.2480
10	0.1870	0.1180	0.1740	0.1720	0.1720
25	0.0870	0.0450	0.0970	0.0680	0.0680
50	0.0480	0.0300	0.0640	0.0340	0.0340
100	0.0350	0.0240	0.0600	0.0270	0.0270

RB2 = 0.1 mM, Fe²⁺ = 20 mg/l, carrier = 74.07 g/l, initial pH = 3

Table D.3 Effect of H₂O₂ concentration on COD removal of RB2 (continued).

Time(min)	H ₂ O ₂ remaining(mg/l)				
	130mg/l H ₂ O ₂	160mg/l H ₂ O ₂	190mg/l H ₂ O ₂	220mg/l H ₂ O ₂	250mg/l H ₂ O ₂
0	130.00	160.00	190.00	220.00	250.00
2	85.00	105.40	147.90	179.35	201.10
5	42.50	73.10	94.35	131.75	155.70
10	30.60	56.10	75.65	110.50	144.00
25	21.25	22.10	44.20	56.95	85.30
50	11.05	6.80	17.85	46.75	47.00
100	0.00	3.40	0.00	18.70	28.10

RB2 = 0.1 mM, Fe²⁺ = 20 mg/l, carrier = 74.07 g/l, initial pH = 3

Appendix E

Comparison of COD removal efficiency by using the same initial COD values

Table E Comparison of COD removal efficiency by using the same initial COD values.

Time(min)	COD remaining(C/C ₀)			
	RB5	RO16	RB2	Mixed
0	1.0000	1.0000	1.0000	1.0000
2	0.6442	0.5491	0.6258	0.7480
5	0.5183	0.5126	0.5743	0.5578
10	0.4455	0.4985	0.4262	0.5258
25	0.3263	0.3550	0.3312	0.4180
50	0.1941	0.1677	0.2267	0.3798
100	0.0881	0.0897	0.1540	0.2405

COD of dyes = 60 mg/l, Fe²⁺ = 20 mg/l, H₂O₂ = 160 mg/l, carrier = 74.07 g/l, pH = 3

Table E Comparison of COD removal efficiency by using the same initial COD values (continued).

Time(min)	color remaining(C/C ₀)			
	RB5	RO16	RB2	Mixed
0	1.0000	1.0000	1.0000	1.0000
2	0.0300	0.0330	0.3080	0.1410
5	0.0190	0.0170	0.1960	0.0910
10	0.0160	0.0120	0.1180	0.0650
25	0.0140	0.0100	0.0450	0.0610
50	0.0140	0.0080	0.0300	0.0550
100	0.0130	0.0080	0.0240	0.0550

COD of dyes = 60 mg/l, Fe²⁺ = 20 mg/l, H₂O₂ = 160 mg/l, carrier = 74.07 g/l, pH = 3

Table E Comparison of COD removal efficiency by using the same initial COD values (continued).

Time(min)	H ₂ O ₂ remaining(C/C ₀)			
	RB5	RO16	RB2	Mixed
0	1.0000	1.0000	1.0000	1.0000
2	0.4680	0.4460	0.6590	0.5530
5	0.3130	0.2600	0.4570	0.3830
10	0.2760	0.2070	0.3510	0.2390
25	0.1800	0.1010	0.1380	0.1170
50	0.1170	0.0430	0.0430	0.0430
100	0.0000	0.0000	0.0210	0.0000

COD of dyes = 60 mg/l, Fe²⁺ = 20 mg/l, H₂O₂ = 160 mg/l, carrier = 74.07 g/l, pH = 3

Appendix F

Effect of Fe^{2+} concentration on color removal of reactive dyes

Table F.1 Effect of Fe²⁺ concentration on color removal of RB5.

Time(min)	COD remaining(C/C ₀)			color remaining(C/C ₀)			H ₂ O ₂ remaining(C/C ₀)		
	1mg/lFe ²⁺	2mg/lFe ²⁺	3mg/lFe ²⁺	1mg/lFe ²⁺	2mg/lFe ²⁺	3mg/lFe ²⁺	1mg/lFe ²⁺	2mg/lFe ²⁺	3mg/lFe ²⁺
0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	1.0021	0.9818	1.0426	0.6220	0.4820	0.2520	0.9180	0.8500	0.7650
5	1.0395	0.9570	1.0713	0.4900	0.2870	0.1510	0.7650	0.7820	0.4850
10	0.9788	0.9381	0.8651	0.3270	0.2110	0.0870	0.7230	0.7400	0.4510
25	0.9314	0.8873	0.7345	0.1970	0.1300	0.0340	0.6800	0.6200	0.3800
50	0.8307	0.8180	0.6910	0.1430	0.0780	0.0160	0.6380	0.5100	0.3060
100	0.7303	0.6879	0.6626	0.0740	0.0370	0.0090	0.6120	0.4420	0.2550

RB5 = 0.1 mM, H₂O₂ = 100 mg/l, carrier = 74.07 g/l, initial pH = 3

Table F.2 Effect of Fe²⁺ concentration on COD removal of RO16; .

Time(min)	COD remaining(C/C ₀)			color remaining(C/C ₀)			H ₂ O ₂ remaining(C/C ₀)		
	1mg/lFe ²⁺	2mg/lFe ²⁺	3mg/lFe ²⁺	1mg/lFe ²⁺	2mg/lFe ²⁺	3mg/lFe ²⁺	1mg/lFe ²⁺	2mg/lFe ²⁺	3mg/lFe ²⁺
0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	1.1017	1.1320	1.2440	0.7600	0.3750	0.3700	0.8250	0.7140	0.6290
5	1.1650	1.0318	1.1628	0.6850	0.1440	0.1060	0.6970	0.6800	0.4250
10	1.1594	0.8406	0.9155	0.5360	0.0590	0.0510	0.6040	0.5900	0.4080
25	1.0253	0.8044	0.8379	0.1660	0.0210	0.0220	0.5530	0.5190	0.3400
50	1.0182	0.6796	0.7036	0.0620	0.0130	0.0120	0.5100	0.4930	0.2890
100	0.8929	0.5940	0.5323	0.0310	0.0100	0.0070	0.4510	0.3740	0.2720

RO16 = 0.1 mM, H₂O₂ = 100 mg/l, carrier = 74.07 g/l, initial pH = 3

Table F.3 Effect of Fe^{2+} concentration on COD removal of RB2.

Time(min)	COD remaining(C/C_0)				
	1mg/ Fe^{2+}	2mg/ Fe^{2+}	3mg/ Fe^{2+}	4mg/ Fe^{2+}	5mg/ Fe^{2+}
0	1.0000	1.0000	1.0000	1.0000	1.0000
2	1.0275	1.0511	1.0255	1.1639	1.0481
5	1.1422	1.1215	1.2256	1.1831	1.0330
10	1.1626	1.0712	1.1307	1.1561	1.0318
25	1.0880	1.0352	1.0292	0.9560	0.9143
50	0.9693	0.9564	0.9261	0.8420	0.7552
100	0.8803	0.8545	0.8445	0.6814	0.5132

RB2 = 0.1 mM, H_2O_2 = 100 mg/l, carrier = 74.07 g/l, initial pH = 3

Table F.3 Effect of Fe^{2+} concentration on COD removal of RB2 (cont.).

Time(min)	color remaining(C/C_0) -				
	1mg/ Fe^{2+}	2mg/ Fe^{2+}	3mg/ Fe^{2+}	4mg/ Fe^{2+}	5mg/ Fe^{2+}
0	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.8820	0.8190	0.7760	0.6880	0.6740
5	0.7620	0.6890	0.6530	0.4610	0.4330
10	0.6100	0.5560	0.5170	0.2990	0.2690
25	0.3670	0.3540	0.3340	0.1660	0.1600
50	0.2330	0.2290	0.2290	0.1090	0.0850
100	0.1910	0.1640	0.1580	0.0580	0.0390

RB2 = 0.1 mM, H_2O_2 = 100 mg/l, carrier = 74.07 g/l, initial pH = 3

Table F.3 Effect of Fe^{2+} concentration on COD removal of RB2 (cont.).

Time(min)	H_2O_2 remaining(C/C_0)				
	1mg/ Fe^{2+}	2mg/ Fe^{2+}	3mg/ Fe^{2+}	4mg/ Fe^{2+}	5mg/ Fe^{2+}
0	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.9440	0.7570	0.7650	0.7480	0.8500
5	0.8080	0.7230	0.5950	0.5870	0.6800
10	0.7310	0.6970	0.5780	0.5360	0.5270
25	0.6800	0.6500	0.5400	0.5190	0.4680
50	0.6290	0.6000	0.4590	0.3740	0.3570
100	0.5950	0.5270	0.4250	0.2720	0.2130

RB2 = 0.1 mM, H_2O_2 = 100 mg/l, carrier = 74.07 g/l, initial pH = 3

Appendix G

Effect of H_2O_2 concentration on color removal of reactive dyes

Table G.1 Effect of H₂O₂ concentration on color removal of RB5.

Time(min)	COD remaining(C/C ₀)			
	50mg/lH ₂ O ₂	100mg/lH ₂ O ₂	150mg/lH ₂ O ₂	200mg/lH ₂ O ₂
0	1.0000	1.0000	1.0000	1.0000
2	0.9849	0.9818	0.9771	0.8883
5	0.9735	0.9570	0.9536	0.8604
10	0.9545	0.9381	0.9176	0.8382
25	0.8961	0.8873	0.8887	0.7887
50	0.8373	0.8180	0.7943	0.6879
100	0.8198	0.6879	0.6591	0.6772

RB5 = 0.1 mM, Fe²⁺ = 2 mg/l, carrier = 74.07 g/l, initial pH = 3

Table G.1 Effect of H₂O₂ concentration on color removal of RB5 (continued).

Time(min)	color remaining(C/C ₀)			
	50mg/lH ₂ O ₂	100mg/lH ₂ O ₂	150mg/lH ₂ O ₂	200mg/lH ₂ O ₂
0	1.0000	1.0000	1.0000	1.0000
2	0.5530	0.4820	0.5050	0.4680
5	0.3780	0.2870	0.3160	0.2770
10	0.2750	0.2110	0.2230	0.2040
25	0.1960	0.1300	0.1430	0.1250
50	0.1450	0.0780	0.0800	0.0750
100	0.0780	0.0370	0.0280	0.0380

RB5 = 0.1 mM, Fe²⁺ = 2 mg/l, carrier = 74.07 g/l, initial pH = 3

Table G.1 Effect of H₂O₂ concentration on color removal of RB5 (continued).

Time(min)	H ₂ O ₂ remaining(mg/l)			
	50mg/lH ₂ O ₂	100mg/lH ₂ O ₂	150mg/lH ₂ O ₂	200mg/lH ₂ O ₂
0	50.00	100.00	150.00	200.00
2	48.45	85.00	124.95	182.75
5	38.25	78.20	114.75	166.60
10	34.00	73.95	102.85	153.00
25	29.75	65.45	88.40	147.90
50	27.20	51.00	77.35	146.20
100	14.45	44.20	74.80	137.70

RB5 = 0.1 mM, Fe²⁺ = 2 mg/l, carrier = 74.07 g/l, initial pH = 3

Table G.2 Effect of H₂O₂ concentration on color removal of RO16.

Time(min)	COD remaining(C/C ₀)			
	50mg/lH ₂ O ₂	100mg/lH ₂ O ₂	150mg/lH ₂ O ₂	200mg/lH ₂ O ₂
0	1.0000	1.0000	1.0000	1.0000
2	1.0678	1.1017	1.1344	1.2771
5	1.2072	1.1650	1.0918	1.2167
10	1.1475	1.1594	1.0683	1.1824
25	1.1135	1.0253	1.0262	1.1321
50	1.0628	1.0182	0.9166	1.0811
100	1.0470	0.8590	0.8660	0.9632

RO16 = 0.1 mM, Fe²⁺ = 1 mg/l, carrier = 74.07 g/l, initial pH = 3

Table G.2 Effect of H₂O₂ concentration on color removal of RO16 (continued).

Time(min)	color remaining(C/C ₀)			
	50mg/lH ₂ O ₂	100mg/lH ₂ O ₂	150mg/lH ₂ O ₂	200mg/lH ₂ O ₂
0	1.0000	1.0000	1.0000	1.0000
2	0.8000	0.7600	0.7570	0.7810
5	0.7110	0.6850	0.6780	0.7100
10	0.6320	0.5360	0.5250	0.5960
25	0.3320	0.1660	0.1760	0.2330
50	0.1310	0.0620	0.0770	0.0840
100	0.0700	0.0310	0.0380	0.0390

RO16 = 0.1 mM, Fe²⁺ = 1 mg/l, carrier = 74.07 g/l, initial pH = 3

Table G.2 Effect of H₂O₂ concentration on color removal of RO16 (continued).

Time(min)	H ₂ O ₂ remaining(mg/l)			
	50mg/lH ₂ O ₂	100mg/lH ₂ O ₂	150mg/lH ₂ O ₂	200mg/lH ₂ O ₂
0	50.00	100.00	150.00	200.00
2	34.85	82.45	136.00	192.95
5	29.75	69.70	131.75	171.70
10	27.20	60.35	122.40	161.50
25	25.50	55.25	116.45	158.10
50	22.10	51.00	102.00	147.90
100	17.00	45.05	95.20	136.00

RO16 = 0.1 mM, Fe²⁺ = 1 mg/l, carrier = 74.07 g/l, initial pH = 3

Table G.3 Effect of H₂O₂ concentration on color removal of RB2.

Time(min)	COD remaining(C/C ₀)			
	50mg/lH ₂ O ₂	100mg/lH ₂ O ₂	150mg/lH ₂ O ₂	200mg/lH ₂ O ₂
0	1.0000	1.0000	1.0000	1.0000
2	1.1206	1.1639	1.0076	0.9958
5	1.1549	1.1831	1.0141	0.9442
10	1.1477	1.1561	0.9865	0.9184
25	1.0851	0.9560	0.9049	0.8929
50	1.0152	0.8420	0.7417	0.7504
100	0.8895	0.6814	0.6928	0.6212

RB2 = 0.1 mM, Fe²⁺ = 4 mg/l, carrier = 74.07 g/l, initial pH = 3

Table G.3 Effect of H₂O₂ concentration on color removal of RB2 (continued).

Time(min)	color remaining(C/C ₀)			
	50mg/lH ₂ O ₂	100mg/lH ₂ O ₂	150mg/lH ₂ O ₂	200mg/lH ₂ O ₂
0	1.0000	1.0000	1.0000	1.0000
2	0.8060	0.6880	0.6690	0.6280
5	0.6660	0.4610	0.4410	0.3890
10	0.4970	0.2990	0.2850	0.2550
25	0.2910	0.1660	0.1600	0.1460
50	0.2110	0.1090	0.0870	0.0860
100	0.1460	0.0580	0.0430	0.0400

RB2 = 0.1 mM, Fe²⁺ = 4 mg/l, carrier = 74.07 g/l, initial pH = 3

Table G.3 Effect of H₂O₂ concentration on color removal of RB2 (continued).

Time(min)	H ₂ O ₂ remaining(mg/l)			
	50mg/lH ₂ O ₂	100mg/lH ₂ O ₂	150mg/lH ₂ O ₂	200mg/lH ₂ O ₂
0	50.00	100.00	150.00	200.00
2	38.25	74.80	115.60	175.10
5	30.60	58.65	111.35	161.50
10	28.05	53.55	102.85	153.00
25	25.50	51.85	94.35	134.30
50	18.70	37.40	79.05	117.30
100	8.50	27.20	54.40	90.10

RB2 = 0.1 mM, Fe²⁺ = 4 mg/l, carrier = 74.07 g/l, initial pH = 3

Appendix H

Comparison of color removal efficiency by using the same initial color values

Table H Comparison of color removal efficiency by using the same initial color values.

Time(min)	COD remaining(C/C ₀)			color remaining(C/C ₀)			H ₂ O ₂ remaining(C/C ₀)		
	RB5	RO16	RB2	RB5	RO16	RB2	RB5	RO16	RB2
0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.9950	0.9948	1.0121	0.4820	0.5590	0.8670	0.8500	0.6800	0.7480
5	0.9833	0.9632	1.0399	0.2870	0.3170	0.8540	0.7820	0.6290	0.7310
10	0.9776	0.9080	1.0573	0.2110	0.1350	0.7990	0.7400	0.5360	0.7230
25	0.9268	0.7602	1.0013	0.1300	0.0630	0.6660	0.6550	0.4250	0.7060
50	0.8575	0.7211	0.9797	0.0780	0.0350	0.5230	0.5100	0.3830	0.6210
100	0.6879	0.5435	0.9227	0.0370	0.0190	0.3640	0.4420	0.3400	0.4680

color of dyes = 6500 ADMI units, Fe²⁺ = 2 mg/l, H₂O₂ = 100 mg/l, carrier = 74.07 g/l, initial pH = 3

Appendix I
COD and color removals of synthetic commercial dyeing wastewater

Table I COD and color removals of synthetic commercial dyeing wastewater.

Time(min)	COD remaining(C/C ₀)			color remaining(C/C ₀)			H ₂ O ₂ remaining(C/C ₀)		
	Black B	Blue ER-A	Orange BR2	Black B	Blue ER-A	Orange BR2	Black B	Blue ER-A	Orange BR2
0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.6011	0.8234	0.8582	0.0370	0.1820	0.3380	0.5260	0.6270	0.6590
5	0.5747	0.7505	0.6276	0.0200	0.1180	0.2550	0.3510	0.4410	0.5310
10	0.5434	0.6328	0.5860	0.0160	0.0780	0.2240	0.2660	0.2340	0.3770
25	0.3524	0.4163	0.4031	0.0120	0.0560	0.1590	0.1700	0.1060	0.2130
50	0.2271	0.4000	0.3479	0.0110	0.0450	0.1130	0.0900	0.0000	0.0690
100	0.1387	0.2963	0.1972	0.0100	0.0420	0.0840	0.0370	0.0000	0.0000

dyes =100 mg/l, Fe²⁺ =20 mg/l, H₂O₂ =160 mg/l, carrier =74.07 g/l and initial pH= 3

Appendix J
Iron recovery

Table J Effect of Fe²⁺ concentration on COD and color removal of RB5; RB5 = 0.1 mM, H₂O₂ = 160 mg/l, carrier = 74.07 g/l, initial pH = 3.

Time(min)	COD remaining(C/C ₀)				color remaining(C/C ₀)			
	20mg/lFe ²⁺	50mg/lFe ²⁺	75mg/lFe ²⁺	100mg/lFe ²⁺	20mg/lFe ²⁺	50mg/lFe ²⁺	75mg/lFe ²⁺	100mg/lFe ²⁺
0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.6442	0.4578	0.4941	0.4116	0.0300	0.0400	0.0470	0.0730
5	0.5183	0.3834	0.3233	0.2850	0.0190	0.0030	0.0440	0.0750
10	0.4455	0.2967	0.2501	0.2216	0.0160	0.0360	0.0430	0.0700
25	0.3263	0.2162	0.2074	0.1773	0.0140	0.0350	0.0420	0.0560
50	0.1941	0.2039	0.1647	0.0950	0.0140	0.0340	0.0380	0.0500
100	0.0881	0.1728	0.1220	0.0759	0.0130	0.0300	0.0330	0.0420

Time(min)	Total iron remaining(C/C ₀)				Fe ²⁺ remaining(mg/l)			
	20mg/lFe ²⁺	50mg/lFe ²⁺	75mg/lFe ²⁺	100mg/lFe ²⁺	20mg/lFe ²⁺	50mg/lFe ²⁺	75mg/lFe ²⁺	100mg/lFe ²⁺
0	1.0000	1.0000	1.0000	1.0000	20.00	50.00	75.00	100.00
2	1.0300	1.0020	0.9500	0.9500	6.64	7.90	9.30	10.55
5	1.0000	1.0040	0.9800	0.9500	3.99	5.11	6.51	7.06
10	1.0200	1.0100	0.9800	0.9400	2.74	3.58	4.83	4.97
25	1.0300	1.0020	0.9700	0.9000	0.65	2.04	3.72	3.58
50	1.0200	0.9790	0.9000	0.8400	0.93	1.76	3.30	3.02
100	1.0000	0.8960	0.7700	0.6900	0.65	3.99	5.39	8.60

Time(min)	H ₂ O ₂ remaining(C/C ₀)			
	20mg/lFe ²⁺	50mg/lFe ²⁺	75mg/lFe ²⁺	100mg/lFe ²⁺
0	1.0000	1.0000	1.0000	1.0000
2	0.4680	0.2660	0.0900	0.0900
5	0.3130	0.1700	0.0690	0.0690
10	0.2760	0.0960	0.0480	0.0480
25	0.1380	0.0480	0.0320	0.0320
50	0.1170	0.0480	0.0160	0.0160
100	0.0000	0.0000	0.0000	0.0000

Appendix K

Effect of Fe^{2+} concentration on COD and color removal of industrial wastewater

Table K Effect of Fe²⁺ concentration on COD and color removal of wastewater from textile factory.

Time(min)	COD remaining(C/C ₀)					color remaining(C/C ₀)				
	[COD]:[Fe ²⁺]:[H ₂ O ₂]					[COD]:[Fe ²⁺]:[H ₂ O ₂]				
	1:0.32:3.17	1:0.63:3.17	1:0.95:3.17	1:1.27:3.17	1:1.59:3.17	1:0.32:3.17	1:0.63:3.17	1:0.95:3.17	1:1.27:3.17	1:1.59:3.17
0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.8635	0.6709	0.5135	0.6835	0.8059	0.3280	0.1720	0.1100	0.1240	0.0700
5	0.6681	0.5887	0.5082	0.5945	0.6510	0.2020	0.1230	0.0920	0.0760	0.0580
10	0.6712	0.5840	0.5048	0.5943	0.6573	0.1670	0.0760	0.0810	0.0710	0.0580
25	0.6898	0.5840	0.5001	0.5897	0.6564	0.1130	0.0700	0.0750	0.0590	0.0460
50	0.6894	0.5575	0.4749	0.5734	0.5954	0.0830	0.0540	0.0520	0.0470	0.0350
100	0.6271	0.4913	0.4662	0.5615	0.5818	0.0650	0.0320	0.0750	0.0540	0.0240

Time(min)	H ₂ O ₂ remaining(C/C ₀)					Fe ²⁺ remaining(C/C ₀)				
	[COD]:[Fe ²⁺]:[H ₂ O ₂]					[COD]:[Fe ²⁺]:[H ₂ O ₂]				
	1:0.32:3.17	1:0.63:3.17	1:0.95:3.17	1:1.27:3.17	1:1.59:3.17	1:0.32:3.17	1:0.63:3.17	1:0.95:3.17	1:1.27:3.17	1:1.59:3.17
0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.8160	0.6800	0.6330	0.5530	0.4780	0.0439	0.0530	0.0530	0.0251	0.0259
5	0.7800	0.6290	0.5660	0.4680	0.3870	0.0297	0.0472	0.0445	0.0193	0.0211
10	0.7060	0.4990	0.4740	0.3760	0.3000	0.0227	0.0414	0.0376	0.0153	0.0177
25	0.5120	0.2590	0.2660	0.1910	0.1470	0.0227	0.0332	0.0198	0.0119	0.0104
50	0.3060	0.1190	0.1190	0.0550	0.0470	0.0156	0.0332	0.0152	0.0101	0.0104
100	0.0700	0.0210	0.0210	0.0130	0.0060	0.0180	0.0309	0.0098	0.0113	0.0075

[COD]:[Fe²⁺]:[H₂O₂] = 1:0.32:3.17 - 1:1.59:3.17, carrier = 74.07 g/l, initial pH = 3

Appendix L

Effect of pH concentration on COD and color removal of industrial wastewater

Table L Effect of pH concentration on COD and color removal of wastewater from textile factory.

Time(min)	COD remaining(C/C ₀)				color remaining(C/C ₀)			
	pH 2	pH 3	pH 4	pH 5	pH 2	pH 3	pH 4	pH 5
0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.7948	0.5135	0.6888	0.7086	0.1740	0.1100	0.1060	0.6030
5	0.7670	0.5082	0.6649	0.6928	0.1740	0.0920	0.0810	0.1750
10	0.7497	0.5048	0.6453	0.6712	0.1590	0.0810	0.0710	0.1610
25	0.7424	0.5001	0.6313	0.6434	0.1440	0.0750	0.0560	0.1480
50	0.6712	0.4749	0.6283	0.6347	0.1020	0.0520	0.0710	0.1260
100	0.6664	0.4662	0.6251	0.6291	0.1020	0.0750	0.0210	0.1120

Time(min)	H ₂ O ₂ remaining(C/C ₀)				Fe ²⁺ remaining(C/C ₀)			
	pH 2	pH 3	pH 4	pH 5	pH 2	pH 3	pH 4	pH 5
0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.8220	0.6330	0.6370	0.6290	0.0240	0.0530	0.0280	0.0230
5	0.7800	0.5660	0.6020	0.5830	0.0200	0.0450	0.0190	0.0180
10	0.7590	0.4740	0.5370	0.5600	0.0200	0.0380	0.0140	0.0140
25	0.7080	0.2660	0.3900	0.4190	0.0200	0.0200	0.0100	0.0100
50	0.6580	0.1190	0.2120	0.2930	0.0140	0.0150	0.0070	0.0050
100	0.4720	0.0210	0.0900	0.1450	0.0150	0.0100	0.0050	0.0030

[COD]:[Fe²⁺]:[H₂O₂] = 1:0.95:3.17, carrier = 74.07 g/l, initial pH = 2-5

Appendix M

Effect of H₂O₂ concentration on COD and color removal of industrial wastewater

Table M Effect of H₂O₂ concentration on COD and color removal of wastewater from textile factory.

Time(min)	COD remaining(C/C ₀)				color remaining(C/C ₀)			
	[COD]:[Fe ²⁺]:[H ₂ O ₂]				[COD]:[Fe ²⁺]:[H ₂ O ₂]			
	1:0.95:3.17	1:0.95:4.76	1:0.95:6.35	1:0.95:7.94	1:0.95:3.17	1:0.95:4.76	1:0.95:6.35	1:0.95:7.94
0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.5135	0.4871	0.3474	0.2114	0.1100	0.1180	0.0830	0.1030
5	0.5082	0.3925	0.2934	0.1509	0.0920	0.0890	0.0640	0.0750
10	0.5048	0.3781	0.2870	0.1327	0.0810	0.0720	0.0470	0.0580
25	0.5001	0.3780	0.2849	0.1698	0.0750	0.0720	0.0290	0.0520
50	0.4749	0.3601	0.3561	0.2498	0.0520	0.0560	0.0290	0.0410
100	0.4662	0.3574	0.3910	0.2934	0.0750	0.0510	0.0350	0.0340

Time(min)	H ₂ O ₂ remaining(C/C ₀)				Fe ²⁺ remaining(C/C ₀)			
	[COD]:[Fe ²⁺]:[H ₂ O ₂]				[COD]:[Fe ²⁺]:[H ₂ O ₂]			
	1:0.95:3.17	1:0.95:4.76	1:0.95:6.35	1:0.95:7.94	1:0.95:3.17	1:0.95:4.76	1:0.95:6.35	1:0.95:7.94
0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	0.6330	0.6898	0.7564	0.7658	0.0530	0.0440	0.0440	0.1020
5	0.5661	0.6133	0.6904	0.6992	0.0450	0.0360	0.0390	0.0720
10	0.4743	0.5291	0.6082	0.6089	0.0380	0.0230	0.0230	0.0460
25	0.2658	0.3124	0.3978	0.3963	0.0200	0.0200	0.0170	0.0210
50	0.1186	0.1479	0.2123	0.2058	0.0150	0.0160	0.0180	0.0140
100	0.0210	0.0268	0.0507	0.0650	0.0100	0.0100	0.0150	0.0110

[COD]:[Fe²⁺]:[H₂O₂] = 1:0.95:3.17 - 1:0.95:7.94, carrier = 74.07 g/l, initial pH = 3

Appendix N
Dyes Calibration Curve

Dyes Calibration Curve

For comparison of color removal efficiency by using the same initial color values, the chosen initial color value in this study was 6500 in ADMI units. The concentration of each dyes were calculated by using the dyes calibration curve.

N.2 Reactive black5

Table N.1 Reactive black5 Calibration.

Concentration (mg/l)	Transmittance Value			ADMI units
	T1	T2	T3	
100.00	1.20	3.32	21.01	4275
50.00	7.00	16.09	48.75	2994
25.00	25.55	39.95	69.66	1860
20.00	33.62	48.17	75.09	1562
12.50	49.88	62.77	83.30	1066
10.00	57.38	68.99	86.50	870
5.00	75.68	83.04	93.00	452

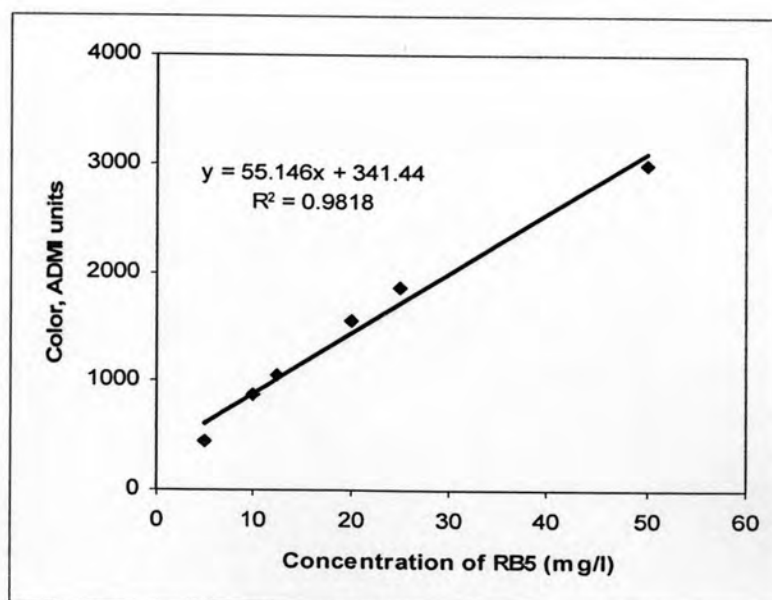


Figure N.1 Reactive black5 Calibration Curve.

N.2 Reactive orange16

Table N.2 Reactive orange16 Calibration.

Concentration (mg/l)	Transmittance Value			ADMI units
	T1	T2	T3	
100.00	94.11	17.94	12.58	10129
75.00	93.27	25.89	20.99	7667
50.00	95.44	40.74	35.21	4892
25.00	97.65	63.84	59.12	2249
20.00	98.14	69.90	65.57	1753
12.50	98.84	79.62	76.59	1076
10.00	99.10	83.43	80.82	845

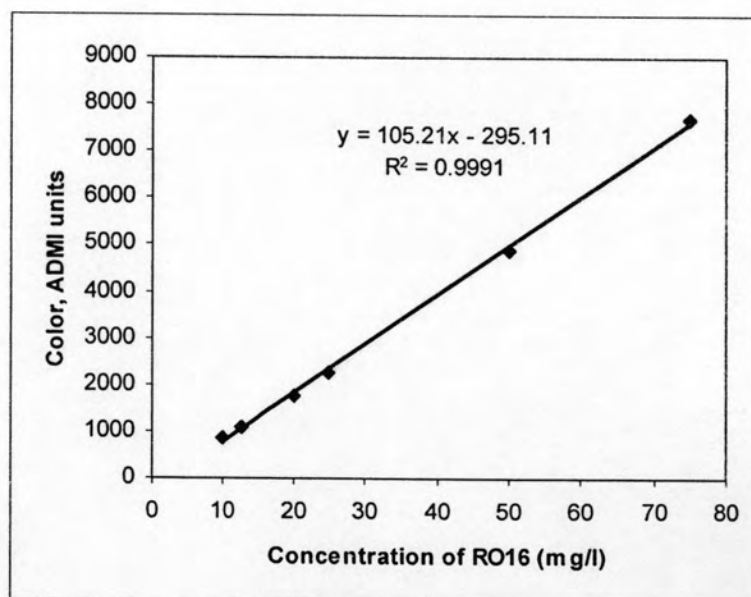


Figure N.2 Reactive orange16 Calibration Curve.

N.3 Reactive blue2

Table N.3 Reactiveblue2 Calibration.

Concentration (mg/l)	Transmittance Value			ADMI units
	T1	T2	T3	
100.00	10.79	32.91	70.27	2829
75.00	19.72	45.19	75.40	2529
50.00	33.63	58.18	82.80	1956
25.00	57.13	76.10	91.42	1155
20.00	63.41	80.05	93.26	953
12.50	74.65	86.71	96.07	627
10.00	78.83	88.55	96.69	494

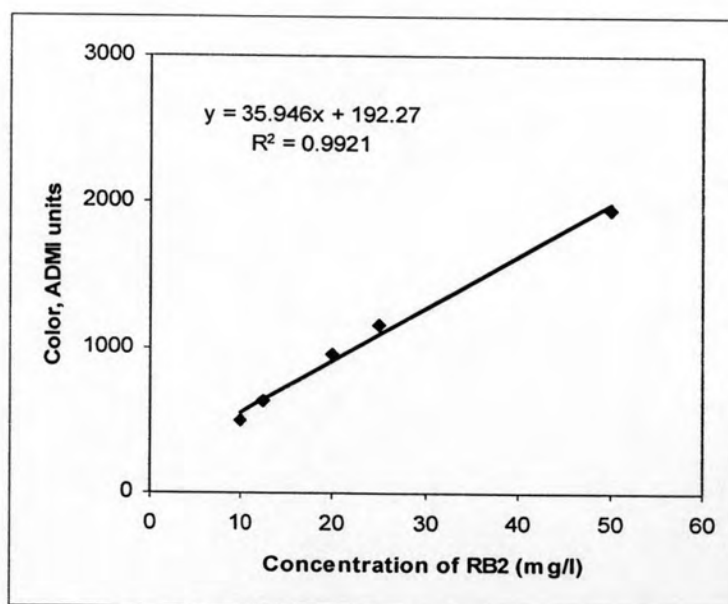


Figure N.3 Reactive blue2 Calibration Curve.

Curriculum Vitae

ประวัติผู้เขียนวิทยานิพนธ์



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