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APPENDIX

Appendix 1

Disappearance rate of acid orange 7 in solution of 2×10^{-4} M by photocatalytic degradation with TiO_2 and by photolytic degradation.

Illumination time (min)	Concentration of dye (C/C_0)					
	0.0 mg of TiO_2	10.0 mg of TiO_2	25.0 mg of TiO_2	50.0 mg of TiO_2	75.0 mg of TiO_2	100.0 mg of TiO_2
0	1.000	1.000	1.000	1.000	1.000	1.000
15	1.000	0.900	0.850	0.780	0.698	0.605
30	0.990	0.840	0.760	0.610	0.420	0.326
45	0.990	0.770	0.670	0.340	0.225	0.090
60	0.970	0.680	0.520	0.270	0.130	
90	0.980	0.500	0.330	0.121	0.07	
120	0.970	0.480	0.180	0.080		
150	0.960	0.350	0.100			
180	0.950	0.200	0.040			
210	0.940	0.120				
240	0.890	0				

Appendix 2

Disappearance rate of acid orange 7 on the photocatalytic degradation with 75 mg of TiO_2. (* means initial concentration of dye)

Illumination time (min)	Concentration of dye (C/C_0)				
	1×10^{-3} M*	2×10^{-4} M*	1×10^{-4} M*	8×10^{-5} M*	5×10^{-5} M*
0	1.000	1.000	1.000	1.000	1.000
5	-	-	0.870	0.830	0.750
10	0.961	0.800	0.750	0.726	0.600
15	0.917	0.698	0.624	0.589	0.510
20	-	0.630	0.530	0.456	0.348
25	-	-	0.400	0.362	0.218
30	0.840	0.420	0.300	0.205	0.135
35	-	-	0.250	0.130	0.060
40	-	0.250	0.170	0.083	0.010
45	0.748	0.225	0.120	0.370	-
50	-	0.045	0.070	0.020	-
55	-	-	0.045	-	-
60	0.680	0.130	0.030	-	-
75	0.630	0.100	-	-	-
90	0.520	0.070	-	-	-
120	0.370	-	-	-	-
150	0.200	-	-	-	-
165	0.110	-	-	-	-
180	0.040	-	-	-	-

Appendix 3

Disappearance rate of azo dyes on the photocatalytic degradation with 75 mg of TiO_2. Initial concentration = 1×10^{-4} M.

Illumination time (min)	Concentration of dye ($\times 10^{-4}$ M)						
	acid orange 7	orange G	acid yellow 17	tartrazine	new coccine	acid black 1	congo red
0	1.000	1.000	1.000	1.000	1.000	1.000	1.000
5	0.630	0.560	0.868	0.800	0.580	0.822	0.900
10	0.400	0.450	0.790	0.778	0.580	0.700	0.800
15	0.345	0.330	0.675	0.700	0.495	0.520	0.660
20	0.270	0.240	0.610	0.580	0.350	0.470	0.610
25	0.220	0.180	0.545	0.495	0.340	0.377	0.550
30	0.175	0.080	0.510	0.430	0.325	0.300	0.500
45	0.110	0.030	0.300	0.270	0.140	0.100	0.380
60	0.025	0.008	0.110	0.150	0.065	0.015	0.310
75	0.015	-	0.097	0.060	0.020	-	0.233
90	0.003	-	0.080	0.010	0.010	-	0.15
105	-	-	0.040	-	-	-	0.050

Appendix 4

Disappearance rate of TOC in 1 x 10^{-4} M of dye solution during photocatalytic degradation with 75 mg of TiO_2.

Illumination time (min)	Concentration of TOC (ppm)						
	acid orange 7	orange G	acid yellow 17	tartrazine	new coccine	acid black 1	congo red
0	18.40	23.40	18.70	22.40	23.10	23.10	41.20
15	13.00	17.40	13.00	20.90	21.30	15.40	26.50
30	9.90	17.20	10.50	18.30	18.30	14.00	21.60
45	8.80	11.50	7.90	15.00	16.80	13.60	20.20
60	7.30	8.00	4.00	12.70	15.10	11.10	19.20
75	4.70	5.50	2.30	-	13.00	-	16.80
90	4.50	1.80	1.40	9.60	12.40	7.85	14.90
105	3.80	-	1.00	6.50	11.40	-	13.00
120	1.45	1.50	0.30	-	9.70	5.80	12.90
135	1.00	-	-	4.00	8.40	-	12.75
150	0.70	1.40	-	-	5.80	3.70	12.60
165	-	-	-	2.60	-	-	12.60
180	-	1.05	-	-	2.90	2.50	12.30
210	-	0.80	-	1.90	1.00	1.40	11.92
240	-	0.40	-	1.50	0.20	0.80	10.50
300	-	-	-	-	-	-	-
360	-	-	-	-	-	-	4.40
420	-	-	-	-	-	-	3.00

Appendix 5

Formation of organic acids in 1 x 10^{-4} M of orange G during photocatalytic degradation with 75 mg of TiO_2.

Illumination time (min)	Concentration of organic acids (x 10^{-6} M)					
	formic acid	glycolic acid	fumaric acid	acetic acid	malonic acid	maleic acid
0	2.75	0	1.80	0	0	0
15	15.98	2.60	2.45	5.80	2.52	0.02
30	20.20	2.90	5.25	8.65	4.80	0.90
45	20.50	3.90	2.75	10.9	4.90	0.88
60	15.10	3.10	2.55	10.50	3.30	-
90	4.65	-	2.50	4.80	-	-
120	4.45	-	2.48	4.50	-	-
180	4.30	-	2.45	5.00	-	-
240	4.25	-	1.70	-	-	-

Appendix 6

Formation of organic acids in 1 x 10^{-4} M of acid orange 7 during photocatalytic degradation with 75 mg of TiO_2.

Illumination time (min)	Concentration of organic acids (x 10^{-6} M)				
	formic acid	glycolic acid	fumaric acid	acetic acid	malonic acid
0	2.75	0	1.60	0	0
15	16.05	-	2.74	5.78	0.85
30	18.90	2.80	2.50	7.28	1.25
45	16.70	3.90	3.04	7.85	1.90
60	5.81	3.02	3.30	6.45	1.07
75	3.31	1.76	4.20	5.03	0.80
90	5.02	-	2.40	4.10	-
105	3.40	-	2.68	-	-
120	5.01	-	3.00	5.90	-
135	4.60	-	2.50	4.92	-
150	3.45	-	1.83	4.03	-

Appendix 7

Formation of organic acids in 1 x 10^{-4} M of acid yellow 17 during photocatalytic degradation with 75 mg of TiO_2.

Illumination time (min)	Concentration of organic acids (x 10^{-6} M)				
	formic acid	glycolic acid	fumaric acid	acetic acid	malonic acid
0	23.01	0	2.46	0	0
15	22.10	2.05	2.77	8.15	-
30	13.42	-	3.00	9.26	3.04
45	16.50	3.75	3.50	19.50	4.11
60	16.94	3.40	4.78	20.13	2.48
90	12.65	3.00	3.47	37.16	2.00
120	5.85	2.10	2.20	34.75	1.77
180	5.70	-	2.10	6.07	-
240	4.60	-	2.12	-	-

Appendix 8

Formation of organic acids in 1 x 10^{-4} M of tartrazine during photocatalytic degradation with 75 mg of TiO_2.

Illumination time (min)	Concentration of organic acids (x 10^{-6} M)					
	formic acid	glycolic acid	fumaric acid	acetic acid	malonic acid	maleic acid
0	0	0	2.76	0	0	0
15	23.80	-	11.38	10.50	2.82	-
30	25.68	3.30	3.77	10.00	3.05	1.50
45	29.10	3.78	4.00	7.23	4.50	1.56
60	27.60	4.15	1.92	6.90	4.80	1.05
90	25.03	3.32	2.40	9.98	7.14	1.44
120	7.00	-	1.85	14.60	3.00	-
150	12.30	3.30	2.78	15.00	2.23	-
180	6.75	-	2.50	6.76	1.10	-
210	6.80	-	2.36	4.80	-	-
240	-	-	1.87	-	-	-

Appendix 9

Formation of organic acids in 1 x 10^{-4} M of new coccine during photocatalytic degradation with 75 mg of TiO_2.

Illumination time (min)	Concentration of organic acids (x 10^{-6} M)						
	formic acid	glycolic acid	fumaric acid	acetic acid	malonic acid	citric acid	glyoxalic acid
0	5.00	0	2.24	4.00	0	0	0
15	16.55	0	3.10	5.14	1.40	0	0
30	16.86	0	5.18	5.18	2.77	0	0
45	19.42	0	3.70	5.19	4.22	0	0
60	20.13	2.17	3.10	5.22	4.70	0	0
75	20.60	2.76	3.22	6.26	3.47	1.47	0
90	22.80	3.60	3.29	9.13	5.65	2.18	0
105	23.48	3.28	5.00	12.10	6.38	2.30	0
120	17.79	2.80	8.79	17.84	5.16	2.90	3.61
135	11.10	-	10.50	21.80	3.75	5.32	7.15
150	9.18	-	5.13	20.79	2.40	2.83	2.50
165	7.25	-	18.28	19.40	1.30	3.25	1.72
180	5.76	-	5.80	12.65	1.00	2.17	-
195	5.60	-	4.30	8.40	-	-	-
210	7.40	-	2.40	5.13	-	-	-

Appendix 10

Formation of organic acids in 1×10^{-4} M of acid black 1 during photocatalytic degradation with 75 mg of TiO_2.

Illumination time (min)	Concentration of organic acids ($\times 10^{-6}$ M)					
	formic acid	glycolic acid	fumaric acid	acetic acid	malonic acid	maleic acid
0	0	0	2.80	0	0	0
15	13.00	0	3.20	6.38	1.78	0
30	21.70	1.78	3.10	6.30	3.10	1.87
45	19.41	-	1.75	6.91	3.90	1.60
60	11.89	2.69	1.30	6.62	3.25	1.75
75	9.21	2.17	1.95	10.65	2.50	2.18
90	6.13	-	2.63	7.26	-	-
120	4.30	-	2.12	4.80	-	-

Appendix 11

Formation of organic acids in 1 x 10^{-4} M of congo red during photocatalytic degradation with 75 mg of TiO_2.

Illumination time (min)	Concentration of organic acids (x 10^{-6} M)						
	formic acid	glycolic acid	fumaric acid	acetic acid	malonic acid	maleic acid	citric acid
0	0	0	2.21	0	0	0	0
15	5.20	0	2.95	0	0	0	0
30	8.00	0	2.33	6.27	0.50	0	0
45	10.00	0	2.70	4.00	0.98	0	0.92
60	16.61	0	4.00	7.10	1.76	0	1.05
90	25.30	2.80	2.34	6.92	2.10	0	-
120	35.80	3.78	2.26	7.50	3.17	1.05	-
150	46.15	5.50	2.40	7.78	4.35	1.43	-
180	48.40	4.00	3.20	8.47	6.02	0.60	-
210	14.95	-	2.80	12.19	3.35	-	-
240	6.83	-	2.24	6.88	-	-	-

Appendix 12

Formation of NO_3^-, NO_2^-, NH_4^+, and SO_4^{2-} in 1 x 10^{-4} M of acid yellow 17 during photocatalytic degradation with 75 mg of TiO_2.

Illumination time (min)	Concentration of ions (x 10^{-5} M)			
	NH_4^+	NO_3^-	NO_2^-	SO_4^{2-}
0	0	0	0	0
15	0	0.20	0.22	11.50
30	0	1.82	0.67	20.09
45	4.65	1.05	1.00	21.70
60	6.90	0.66	0	18.20
75	9.87	-	0	-
90	13.30	-	0	31.90
105	16.96	1.15	0	-
120	17.34	1.80	0	41.15
135	18.15	-	0	-
150	18.30	1.81	0	35.08
180	18.20	2.40	0	42.00
210	19.45	2.40	0	36.67
240	18.10	2.93	0	40.15
255	18.50	2.41	0	32.89

Appendix 13

Formation of NO_3^-, NO_2^-, NH_4^+, and SO_4^{2-} in 1 x 10^{-4} M of acid black 1 during photocatalytic degradation with 75 mg of TiO_2.

Illumination time (min)	Concentration of ions (x 10^{-5} M)			
	NH_4^+	NO_3^-	NO_2^-	SO_4^{2-}
0	0	0	0	0
20	0	1.05	1.06	16.08
30	0	1.00	1.02	17.90
45	6.92	0.99	1.10	16.00
60	9.15	1.19	1.80	18.17
75	12.23	1.85	1.85	21.46
90	16.32	1.80	2.16	20.89
105	20.10	-	-	-
120	24.01	3.70	0.89	-
135	27.24	-	-	-
150	26.30	3.80	0.62	19.41
180	26.50	4.00	-	20.32
210	-	4.38	1.18	18.63
240	26.78	6.40	0.70	19.80

Appendix 14

Formation of NO_3^-, NO_2^-, NH_4^+, and SO_4^{2-} in 1 x 10^{-4} M of orange G during photocatalytic degradation with 75 mg of TiO_2.

Illumination time (min)	Concentration of ions (x 10^{-5} M)			
	NH_4^+	NO_3^-	NO_2^-	SO_4^{2-}
0	0	0	0	0
15	0	0	0.52	3.07
30	4.50	0	0.45	3.40
45	4.89	1.17	0.70	-
60	6.91	1.60	0.69	10.79
75	10.00	-	-	-
90	12.80	2.58	0.71	19.35
105	13.16	-	0	-
120	13.70	2.62	0	20.04
135	12.71	-	0	-
150	13.10	2.37	0	18.27
165	14.06	-	0	-
180	13.00	2.38	0	19.50

VITA

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