Table S1. Optimized MS/MS parameters and detection limits for target compounds.

Compound	IDL (µg/L)[a]	Q1	Q3	Polarity	DP	EP	CEP	CE	CXP
Atenolol	2	267.2	145.1	+	51	3	30.00	36	5
Atorvastatin	8	559.3	440.2	+	83	5.9	18.91	32	22
Atrazine	1	216.0	174.3	+	66.9	3.8	13.5	27.0	2.4
Carbamazepine	1	216.2	174.3	+	55	4.9	14.3	51	2.7
Diclofenac	1	293.9	250.0	−	-46.0	-2.5	-22.53	-15.0	-1.7
10,11 epoxide carbamazepine	1	253.2	180.3	+	26	3.5	20	34	5
Fluoxetine	3	310.3	44.3	+	48	2.9	12.08	44	7
Gemfibrozil	1	249.1	121.1	−	-55.0	-2.0	-20.87	-17.0	-3.0
Ibuprofen	2	204.9	160.9	−	-41	-2.6	-19.24	-11	-0.5
Naproxen	3	229.0	170.0	−	-29	-1.9	-20.13	-25	-3.8
Norfluoxetine	10	296.1	134.1	+	23	3	9.5	9	5
o-hydroxy atorvastatin	10	575.2	440.3	+	64	4	19	32	5
p-hydroxy atorvastatin	10	575.2	440.3	+	64	4	19	32	5
Sulfamethoxazole	1	254.1	156.2	+	41	3	9.00	22.1	3
Triclocarban	4	314.8	161.6	−	-50	-3	-12	-20	-13
Triclosan	10	286.9	35.0	−	-33	-2	-7	-30	-3
Trimethoprim	0.5	291.1	261.2	+	59.0	4.0	12.00	32.0	3.0
Venlafaxine	1	278.3	58.1	+	38.2	2.9	21.00	42	8

[a] the samples were consequently concentrated via solvent evaporation and reconstitution at the IDLs (the concentration factor is 25)

Table S2. Optimized MS/MS parameters for deuterated standards.

Deuterated standards	Q1	Q3	Polarity	DP	EP	CEP	CE	CXP
carbamazepine- d_5	247.200	204.400	+	60.9	4.3	17.07	28.0	3.3
venlafaxine- d_6	284.271	64.100	+	44.8	3.3	18.22	45.0	2.4
fluoxetine- d_5	315.200	44.200	+	50.0	4.0	18.97	38.2	3.1
atenolol- d_7	274.300	145.200	+	49.8	3.7	41.40	35.6	3.7
sulfamethoxazole- d_4	258.122	160.100	+	54.0	4.0	25.00	37.0	3.0
ibuprofen- d_3	207.900	164.100	−	-24.1	-7.6	-19.35	-10.0	-3.0
atorvastatin- d_5	564.300	445.300	+	45.6	4.0	25.94	30.0	16.0
naproxen- d_3	233.000	16.900	−	-36.8	-2.0	-20.28	-25.7	-1.0
triclosan- d_3	289.900	35.000	−	-28.5	-2.0	-11.31	-25.3	-2.3
triclocarban- d_4	316.900	159.900	−	-50.0	-2.5	-23.38	-18.0	-2.0
10,11 epoxide carbamazepine - d_{10}	263.200	190.300	+	53.0	3.5	20.00	34.0	5.0
norfluoxetine- d_5	301.200	139.200	+	23.0	3.0	10.00	9.0	5.0
p-hydroxtatorvastatin- d_5	580.200	445.200	+	64.0	4.0	19.00	32.0	5.0
o-hydroxtatorvastatin- d_5	580.200	445.200	+	64.0	4.0	19.00	32.0	5.0
emfibrozil- d_6	255	120.7	−	-46.5	-11	-21.091	-19.2	-2
norfluoxetine- d_5	301.2	139.2	+	10	10	9	9	5
diclofenac- d_4	298.2	253.8	−	-25.8	-6.9	-22.689	-16.9	-6.1
trimethoprim- d_3	294.2	230.3	+	22	22	31	31	6

Table S3. Ionization parameters for LC-MS/MS

Ionization parameters	Positive	Negative
Curtain Gas (psig)	30	10
Collision Gas (psig)	Medium	Medium
Ion Spray Voltage	5500	-4500
Temperature (^{o}C)	750	750
Ion Source Gas 1	50	60
Ion Source Gas 2	30	40

Table S4. Chromatographic parameters for LC-MS/MS

Chromatographic parameters	
Injection volume (μL)	20
Solvent A	5 mM ammonium acetate in water
Solvent B	methanol
Flow rate (mL/min)	0.8

Table S5. Mobile phase gradient for LC-MS/MS

Positive mode		Negative mode	
Time (min)	% B	Time (min)	% B
0	10	0	10
0.5	10	0.5	10
0.51	50	0.51	40
8	100	8	100
10	100	11	100
10.01	10	11.5	10
15.01	10	16	10

Table S6. Individual and cumulative kinetic rates for reactions spiked with methanol.

	0% Methanol			0.002% Methanol			0.02% Methanol			0.2% Methanol		
Compound	$\|K_{app}\|$ (min^{-1})	R^2	Standard deviation	$\|K_{app}\|$ (min^{-1})	R^2	Standard deviation	$\|K_{app}\|$ (min^{-1})	R^2	Standard deviation	$\|K_{app}\|$ (min^{-1})	R^2	Standard deviation
IBU	0.0188	0.9173	0.0010	0.0228	0.9261	0.0017	0.0156	0.9391	0.0027	0.0114	0.0042	0.9870
NPX	0.0325	0.8606	0.0013	0.0373	0.7946	0.0031	0.0341	0.9339	0.0062	0.0333	0.0100	0.9705
GFZ	0.0302	0.8216	0.0036	0.0297	0.8917	0.0010	0.0194	0.9429	0.0037	0.0128	0.0062	0.9878
DCF	0.0149	0.8792	0.0021	0.0160	0.9156	0.0025	0.0195	0.9005	0.0006	0.0362	0.0048	0.9104
TCS	0.0203	0.7344	0.0175	0.0075	0.8678	0.0102	0.0110	0.9427	0.0018	0.0123	0.0015	0.9982
TCCB	0.0195	0.9366	0.0035	0.0143	0.9276	0.0041	0.0060	0.9579	0.0014	0.0077	0.0002	0.9720
ATRZ	0.0036	0.8330	0.0014	0.0021	0.9094	0.0007	0.0001	0.1504	0.0001	0.0003	0.0003	0.0971
CBZ	0.0138	0.9507	0.0039	0.0079	0.9496	0.0026	0.0014	0.8830	0.0004	0.0006	0.0007	0.4879
FLX	0.0102	0.9460	0.0028	0.0074	0.9616	0.0020	0.0026	0.9363	0.0007	0.0041	0.0031	0.8958
ATOR	0.0270	0.7010	0.0110	0.0240	0.8606	0.0042	0.0140	0.9673	0.0048	0.0395	0.0047	0.7533
VEN	0.0098	0.9221	0.0034	0.0059	0.9018	0.0015	0.0012	0.8670	0.0003	0.0003	0.0002	0.2100
SULF	0.0290	0.9283	0.0043	0.0277	0.9466	0.0049	0.0084	0.9283	0.0023	0.0040	0.0009	0.9275
TRIM	0.0104	0.9199	0.0030	0.0065	0.9365	0.0011	0.0015	0.5038	0.0012	0.0010	0.0003	0.3893
NFLX	0.0084	0.9197	0.0026	0.0072	0.9614	0.0011	0.0038	0.9455	0.0010	0.0039	0.0042	0.6284
ATEN	0.0068	0.9326	0.0016	0.0039	0.9289	0.0015	0.0003	0.2185	0.0006	0.0004	0.0011	0.6730
e-CBZ	0.0098	0.9289	0.0035	0.0058	0.9462	0.0020	0.0008	0.5839	0.0006	0.0002	0.0004	0.1225
p-ATOR	0.0293	0.8237	0.0056	0.0243	0.7858	0.0032	0.0029	0.9523	0.0004	0.0640	0.0262	0.6343
o-ATOR	0.0284	0.7651	0.0032	0.0216	0.7123	0.0022	0.0048	1.0000	0.0030	0.0442	0.0093	0.6108
total	0.0116	0.9665	0.0024	0.0087	0.9752	0.0014	0.0038	0.9471	0.0012	0.0039	0.9576	0.0005

Table S7. Tukey's means comparison test at the α = 0.05 significance level for PPCPs treated under UV light at varying methanol concentrations.

Compound		0.002% vs 0%	0.02% vs 0%	0.02% vs 0.002%	0.2% vs 0%	0.2% vs 0.002%	0.2% vs 0.02%
IBU	p-value	0.3217	0.5121	0.0446	0.0384	0.0035	0.2812
	Significance [a]	0	0	1	1	1	0
NPX	p-value	0.7852	0.9895	0.9174	0.9987	0.8575	0.9986
	Significance [a]	0	0	0	0	0	0
GFZ	p-value	0.9985	0.0452	0.0564	0.0034	0.0042	0.2734
	Significance [a]	0	1	0	1	1	0
DCF	p-value	0.9625	0.2886	0.5033	0.0001	0.0001	0.0005
	Significance [a]	0	0	0	1	1	1
TCS	p-value	0.4563	0.6843	0.9736	0.7716	0.9352	0.9984
	Significance [a]	0	0	0	0	0	0
TCCB	p-value	0.1787	0.0015	0.0265	0.0037	0.0779	0.8658
	Significance [a]	0	1	1	1	0	0
ATRZ	p-value	0.2330	0.0028	0.0416	0.0021	0.0302	0.9953
	Significance [a]	0	1	1	1	1	0
CBZ	p-value	0.0670	0.0010	0.0415	0.0007	0.0234	0.9745
	Significance [a]	0	1	1	1	1	0
FLX	p-value	1.0000	1.0000	1.0000	0.5115	0.5185	0.5302
	Significance [a]	0	0	0	0	0	0
ATOR	p-value	0.9417	0.1622	0.3372	0.1901	0.0875	0.0075
	Significance [a]	0	0	0	0	0	1
VEN	p-value	0.1269	0.0023	0.0613	0.0013	0.0294	0.9506
	Significance [a]	0	1	0	1	1	0
SULF	p-value	0.9719	0.0004	0.0006	0.0001	0.0001	0.4635
	Significance [a]	0	1	1	1	1	0
TRIM	p-value	0.0846	0.0009	0.0287	0.0007	0.0183	0.9867
	Significance [a]	0	1	1	1	1	0
NFLX	p-value	0.9428	0.2035	0.4092	0.2193	0.4360	0.9999
	Significance [a]	0	0	0	0	0	0
ATEN	p-value	0.0821	0.0010	0.0314	0.0010	0.0336	1.0000
	Significance [a]	0	1	1	1	1	0
e-CBZ	p-value	0.1544	0.0028	0.0636	0.0018	0.0375	0.9807
	Significance [a]	0	1	0	1	1	0
p-ATOR	p-value	0.9325	0.0666	0.1441	0.0332	0.0174	0.0016
	Significance [a]	0	0	0	1	1	1
o-ATOR	p-value	0.4392	0.0026	0.0189	0.0263	0.0034	0.0001
	Significance [a]	0	1	1	1	1	1
total	p-value	0.1688	0.0011	0.0183	0.0012	0.0204	0.9998
	Significance [a]	0	1	1	1	1	0

Note: [a] A significance of 1 means the values compared are significantly different

Table S8. Tukey's means comparison test at the $\alpha = 0.05$ significance level for PPCPs treated under continuous and dual frequency lighting.

Compound	p-value	Significance [a]
ATEN	0.3963	0
ATOR	0.0180	1
ATRZ	0.3023	0
CBZ	0.0899	0
DCF	0.3918	0
e-CBZ	0.7346	0
FLX	0.2458	0
GFZ	0.1453	0
IBU	0.3227	0
NFLX	0.0596	0
NPX	0.8685	0
o-ATOR	0.5542	0
p-ATOR	0.8455	0
SULF	0.1178	0
TCCB	0.0203	1
TCS	0.0321	1
TRIM	0.3874	0
VEN	0.9304	0
total	0.3874	0

Note: [a] A significance of 1 means the values compared are significantly different

Table S9. Individual and cumulative kinetic rates for reactions under continuous UV at varying pH.

	pH 3			pH 5			pH 10		
Compound	$\|K_{app}\|$ (min^{-1})	R^2	Standard deviation	$\|K_{app}\|$ (min^{-1})	R^2	Standard deviation	$\|K_{app}\|$ (min^{-1})	R^2	Standard deviation
IBU	0.0029	0.8194	0.0013	0.0050	0.9908	0.0012	0.0009	0.6885	0.0002
NPX	0.0108	0.9344	0.0006	0.0150	0.9876	0.0029	0.0006	0.4586	0.0004
GFZ	0.0051	0.8962	0.0009	0.0055	0.9888	0.0009	0.0002	0.0555	0.0006
DCF	0.0114	0.9295	0.0023	0.0175	0.9785	0.0023	0.0000	0.5085	0.0006
TCS	0.0017	0.8968	0.0002	0.0030	0.9906	0.0004	0.0008	0.5217	0.0008
TCCB	0.0005	0.4783	0.0002	0.0011	0.9678	0.0002	0.0009	0.6885	0.0002
ATRZ	0.0016	0.2191	0.0020	0.0001	0.1066	0.0003	0.0003	0.1508	0.0003
CBZ	0.0004	0.1775	0.0008	0.0006	0.8315	0.0001	0.0001	0.0897	0.0002
FLX	0.0000	-0.0553	0.0003	0.0003	0.0100	0.0002	0.0045	0.8721	0.0002
ATOR	0.0112	0.7345	0.0027	0.0165	0.9952	0.0012	0.0002	0.2218	0.0009
VEN	0.0002	0.4770	0.0006	0.0001	-0.0374	0.0001	0.0031	0.7933	0.0010
SULF	0.0031	0.9071	0.0010	0.0044	0.9961	0.0004	0.0009	0.4590	0.0002
TRIM	0.0017	0.5164	0.0008	0.0013	0.9288	0.0004	0.0011	0.8731	0.0002
NFLX	0.0003	0.1152	0.0001	0.0005	0.2283	0.0006	0.0041	0.7470	0.0006
ATEN	0.0002	0.0698	0.0006	0.0001	-0.0043	0.0002	0.0030	0.6670	0.0015
e-CBZ	0.0001	0.1077	0.0018	0.0003	0.4575	0.0004	0.0000	-0.1526	0.0001
p-ATOR	0.0085	0.6225	0.0026	0.0185	0.5724	0.0077	0.0013	0.4121	0.0008
o-ATOR	0.0085	0.7356	0.0010	0.0220	0.9730	0.0013	0.0008	0.3164	0.0009
total	0.0018	0.9487	0.0002	0.0025	0.9516	0.0004	0.0006	0.6665	0.0000

Table S10. Individual and cumulative kinetic rates for PPCPs under dual frequency (50Hz and 0.1Hz) UV light at varying pH.

	pH 3			pH 5			pH 10		
Compound	$\|K_{app}\|$ (min^{-1})	R^2	Standard deviation	$\|K_{app}\|$ (min^{-1})	R^2	Standard deviation	$\|K_{app}\|$ (min^{-1})	R^2	Standard deviation
IBU	0.0031	0.7632	0.0019	0.0037	0.9362	0.0015	0.0006	0.6613	0.0001
NPX	0.0130	0.8704	0.0009	0.0147	0.9886	0.0003	0.0008	0.4623	0.0006
GFZ	0.0086	0.9747	0.0027	0.0066	0.9836	0.0006	0.0002	0.5017	0.0007
DCF	0.0077	0.7650	0.0033	0.0162	0.9811	0.0007	0.0003	0.2998	0.0006
TCS	0.0004	0.0954	0.0008	0.0021	0.9488	0.0002	0.0002	0.4065	0.0004
TCCB	0.0007	0.6756	0.0003	0.0008	0.9024	0.0001	0.0006	0.6613	0.0001
ATRZ	0.0002	-0.0204	0.0001	0.0001	-0.1778	0.0001	0.0003	0.0318	0.0005
CBZ	0.0008	0.5323	0.0005	0.0002	0.0787	0.0004	0.0001	0.3779	0.0003
FLX	0.0000	-0.0366	0.0001	0.0003	0.4605	0.0007	0.0050	0.7631	0.0006
ATOR	0.0087	0.7916	0.0010	0.0134	0.9776	0.0008	0.0002	0.6796	0.0011
VEN	0.0004	0.5041	0.0006	0.0001	-0.1311	0.0002	0.0033	0.9516	0.0007
SULF	0.0049	0.8636	0.0031	0.0039	0.9520	0.0002	0.0002	0.2775	0.0003
TRIM	0.0042	0.6686	0.0041	0.0002	-0.0693	0.0002	0.0001	0.4284	0.0005
NFLX	0.0005	0.6868	0.0001	0.0005	0.0658	0.0003	0.0049	0.6906	0.0010
ATEN	0.0002	0.4857	0.0006	0.0004	0.0428	0.0005	0.0041	0.9557	0.0010
e-CBZ	0.0008	0.4109	0.0010	0.0007	0.3803	0.0019	0.0005	0.5101	0.0001
p-ATOR	0.0133	0.8737	0.0030	0.0194	0.9725	0.0028	0.0001	0.2658	0.0008
o-ATOR	0.0108	0.7855	0.0014	0.0205	0.9696	0.0036	0.0001	0.1757	0.0006
total	0.0019	0.9523	0.0006	0.0022	0.9479	0.0003	0.0003	0.5080	0.0004

Table S11. Tukey's means comparison test for degradation rates of PPCPs at different pH under continuous UV light.

Compound		pH5 vs pH3	pH10 vs pH3	pH10 vs pH5
IBU	p-value	0.1059	0.1103	0.0064
	Significance [a]	0	0	1
NPX	p-value	0.0577	0.0005	0.0001
	Significance [a]	0	1	1
GFZ	p-value	0.7949	0.0005	0.0003
	Significance [a]	0	1	1
DCF	p-value	0.019	0.001	0.000
	Significance [a]	1	1	1
TCS	p-value	0.0700	0.1646	0.0063
	Significance [a]	0	0	1
TCCB	p-value	0.0194	0.1070	0.3965
	Significance [a]	1	0	0
ATRZ	p-value	0.2513	0.2039	0.9847
	Significance [a]	0	0	0
CBZ	p-value	0.8224	0.6341	0.3347
	Significance [a]	0	0	0
FLX	p-value	0.4566	0.0000	0.0000
	Significance [a]	0	1	1
ATOR	p-value	0.0244	0.0006	0.0001
	Significance [a]	1	1	1
VEN	p-value	0.9807	0.0051	0.0042
	Significance [a]	0	1	1
SULF	p-value	0.1047	0.0101	0.0011
	Significance [a]	0	1	1
TRIM	p-value	0.7108	0.4741	0.9041
	Significance [a]	0	0	0
NFLX	p-value	0.9150	0.0001	0.0000
	Significance [a]	0	1	1
ATEN	p-value	0.9930	0.0150	0.0170
	Significance [a]	0	1	1
e-CBZ	p-value	0.8451	0.9908	0.9044
	Significance [a]	0	0	0
p-ATOR	p-value	0.0917	0.2242	0.0101
	Significance [a]	0	0	1
o-ATOR	p-value	0.0000	0.0003	0.0000
	Significance [a]	1	1	1
total	p-value	0.0381	0.0040	0.0003
	Significance [a]	1	1	1

Note: [a] A significance of 1 means the values compared are significantly different

Table S12. Tukey's means comparison test for degradation rates of PPCPs at different pH under dual frequency UV light.

Compound		pH5 vs pH3	pH10 vs pH3	pH10 vs pH5
IBU	p-value	0.8632	0.1410	0.0725
	Significance [a]	0	0	0
NPX	p-value	0.0391	0.0000	0.0000
	Significance [a]	1	1	1
GFZ	p-value	0.3572	0.0018	0.0073
	Significance [a]	0	1	1
DCF	p-value	0.0047	0.0064	0.0001
	Significance [a]	1	1	1
TCS	p-value	0.0140	0.9147	0.0091
	Significance [a]	1	0	1
TCCB	p-value	0.9677	0.6351	0.5013
	Significance [a]	0	0	0
ATRZ	p-value	0.5205	0.1926	0.6887
	Significance [a]	0	0	0
CBZ	p-value	0.2542	0.0840	0.6749
	Significance [a]	0	0	0
FLX	p-value	0.7852	0.0001	0.0001
	Significance [a]	0	1	1
ATOR	p-value	0.0021	0.0001	0.0000
	Significance [a]	1	1	1
VEN	p-value	0.4332	0.0003	0.0008
	Significance [a]	0	1	1
SULF	p-value	0.7801	0.0318	0.0737
	Significance [a]	0	1	0
TRIM	p-value	0.1790	0.1762	0.9999
	Significance [a]	0	0	0
NFLX	p-value	0.1839	0.0001	0.0002
	Significance [a]	0	1	1
ATEN	p-value	0.9741	0.0009	0.0008
	Significance [a]	0	1	1
e-CBZ	p-value	0.3545	0.9682	0.4652
	Significance [a]	0	0	0
p-ATOR	p-value	0.0472	0.0013	0.0002
	Significance [a]	1	1	1
o-ATOR	p-value	0.0041	0.0024	0.0001
	Significance [a]	1	1	1
total	p-value	0.6725	0.0131	0.0053
	Significance [a]	0	1	1

Note: [a] A significance of 1 means the values compared are significantly different

Table S13. Linear regression analysis of the degradation rates of PPCPs under continuous and dual frequency light using charge, mass, and solubility.

	R^2, continuous UV			R^2, dual frequency UV		
Variables	pH 3	pH 5	pH 10	pH 3	pH 5	pH 10
Charge	0.4101	0.6275	0.2033	0.3719	0.6167	0.3448
Charge and mass	0.5230	0.8238	0.3193	0.5108	0.8054	0.4091
Charge, mass, and solubility	0.5316	0.8890	0.2711	0.5763	0.8853	0.3711

Table S14. Correlation analysis of PPCP degradation rates under continuous and dual frequency lighting with charge, mass, and solubility.

	Dual frequency UV light					Continuous UV light				
	Model		Charge	Mass	Solubility	Model		Charge	Mass	Solubility
pH 5	Pearson	Coefficient	0.7995	-0.7055	0.6014	Pearson	Coefficient	0.8059	-0.7143	0.6224
		Significance	0.0001	0.0011	0.0083		Significance	0.0001	0.0009	0.0058
	Spearman	Coefficient	0.8813	-0.3841	0.5670	Spearman	Coefficient	0.9219	-0.2850	0.6249
		Significance	0.0000	0.1156	0.0141		Significance	0.0000	0.2517	0.0056
	Kendall	Coefficient	0.7421	-0.2885	0.4305	Kendall	Coefficient	0.7966	-0.1705	0.4835
		Significance	0.0000	0.0954	0.0135		Significance	0.0000	0.3244	0.0055
pH 10	Pearson	Coefficient	-0.6192	0.1019	0.4283	Pearson	Coefficient	-0.5002	-0.0299	0.4125
		Significance	0.0062	0.6875	0.0762		Significance	0.0345	0.9063	0.0889
	Spearman	Coefficient	-0.5797	-0.1384	0.6540	Spearman	Coefficient	-0.4546	-0.4442	0.4541
		Significance	0.0117	0.5838	0.0032		Significance	0.0581	0.0648	0.0584
	Kendall	Coefficient	-0.4841	-0.0724	0.5128	Kendall	Coefficient	-0.3541	-0.3355	0.3188
		Significance	0.0083	0.6765	0.0042		Significance	0.0534	0.0531	0.0748
pH 3	Pearson	Coefficient	0.6394	-0.5662	0.5911	Pearson	Coefficient	0.6669	-0.5427	0.6370
		Significance	0.0043	0.0143	0.0098		Significance	0.0025	0.0200	0.0045
	Spearman	Coefficient	0.8179	-0.2571	0.6279	Spearman	Coefficient	0.8912	-0.1817	0.6736
		Significance	0.000034	0.3031	0.0053		Significance	0.0000	0.4705	0.0022
	Kendall	Coefficient	0.6562	-0.1967	0.4550	Kendall	Coefficient	0.7667	-0.0787	0.4817
		Significance	0.0003	0.2555	0.0095		Significance	0.0000	0.6492	0.0060

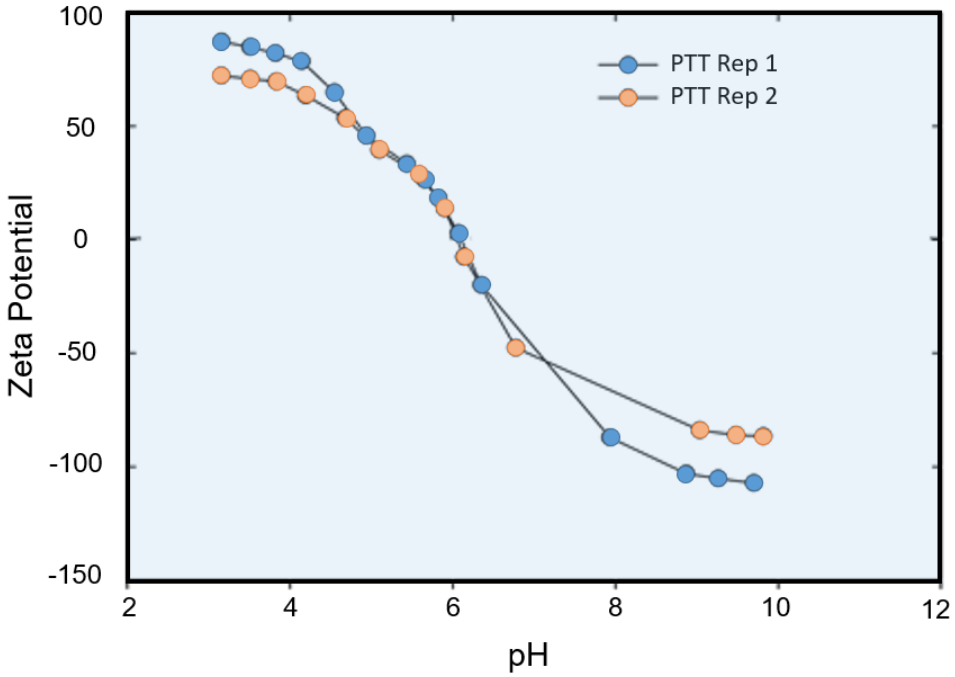

Figure S1. Zeta potential readings for PTT. pIEP is the point with a zero-zeta potential (approximately at pH 6).

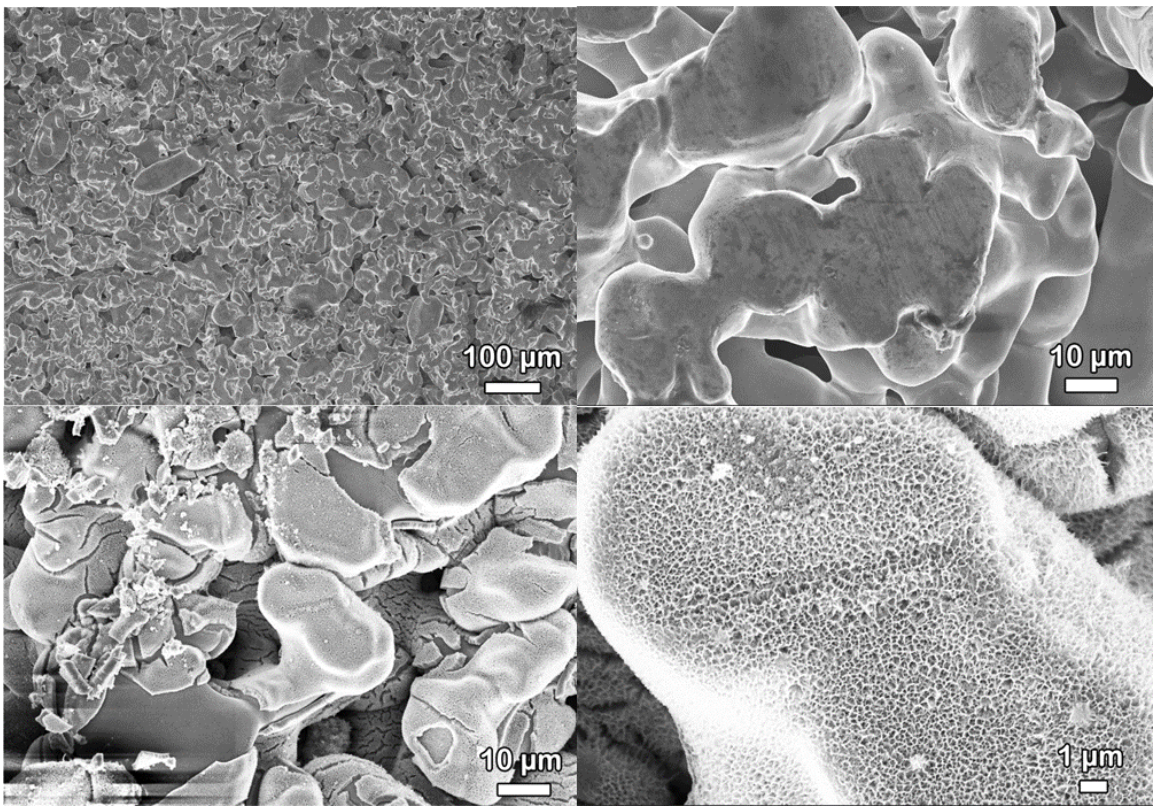

Figure S2. High-resolution SEM of the morphology of the membranes at different magnifications.

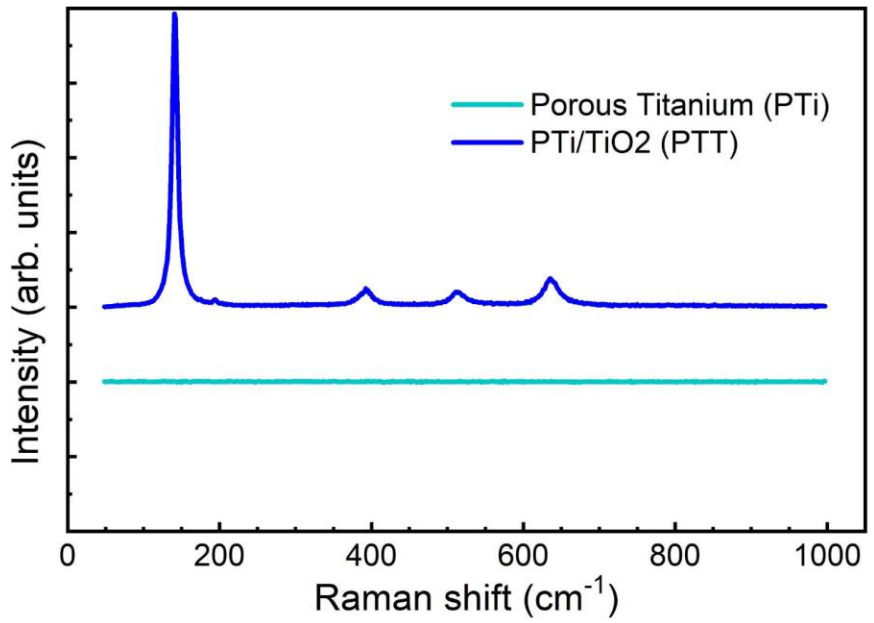

Figure S3. Raman characterization at 488 nm of the PTi and PTT samples.

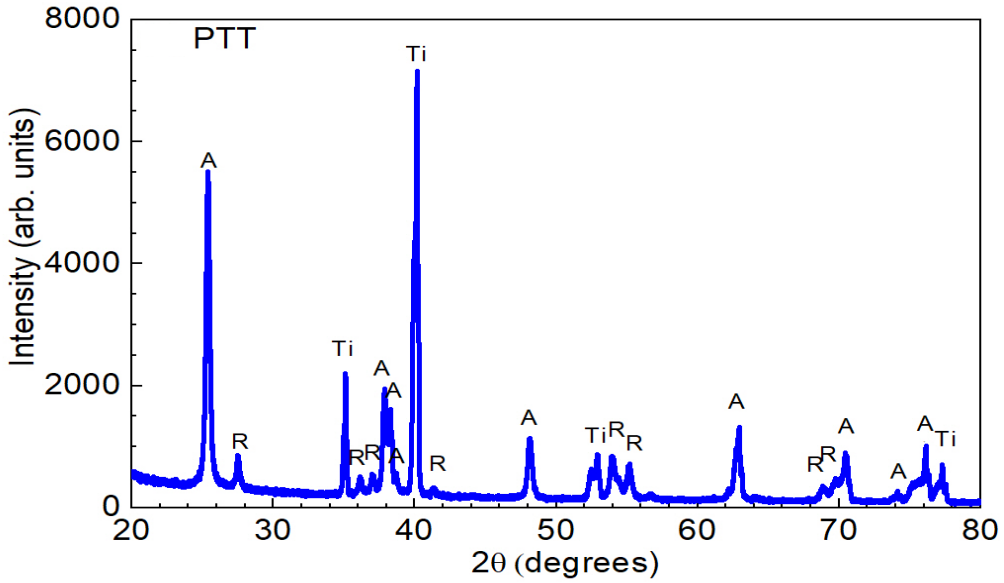

Figure S4. X-ray diffraction for the PTT membrane sample.

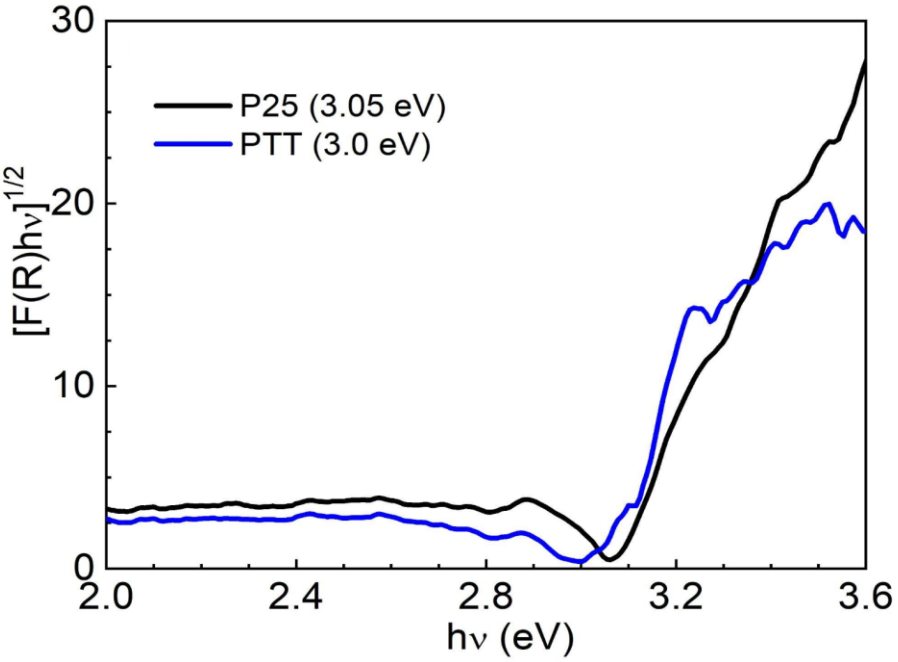

Figure S5. Tauc plots for the P25 and PTT samples.

Linear Fit at different light exposures and pHs

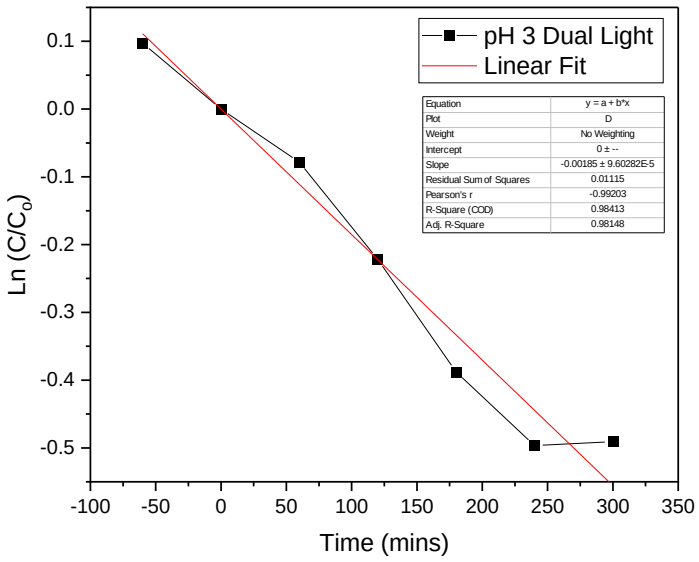

Figure S6. pH3 Dual light linear fit

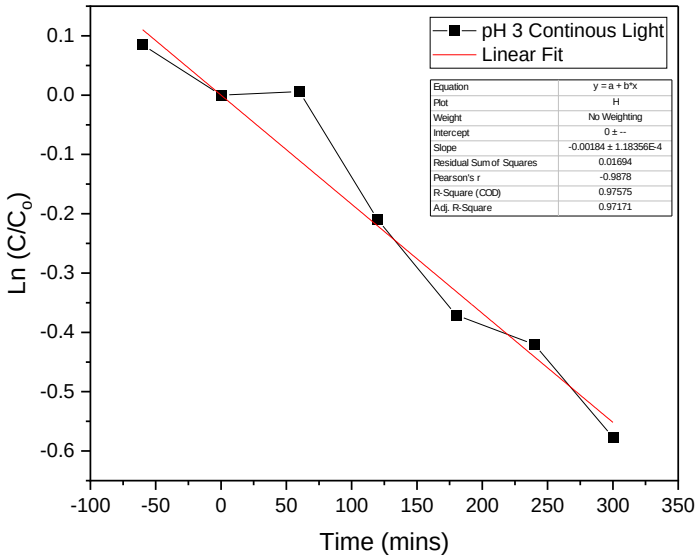

Figure S7. pH3 Continuous light linear fit

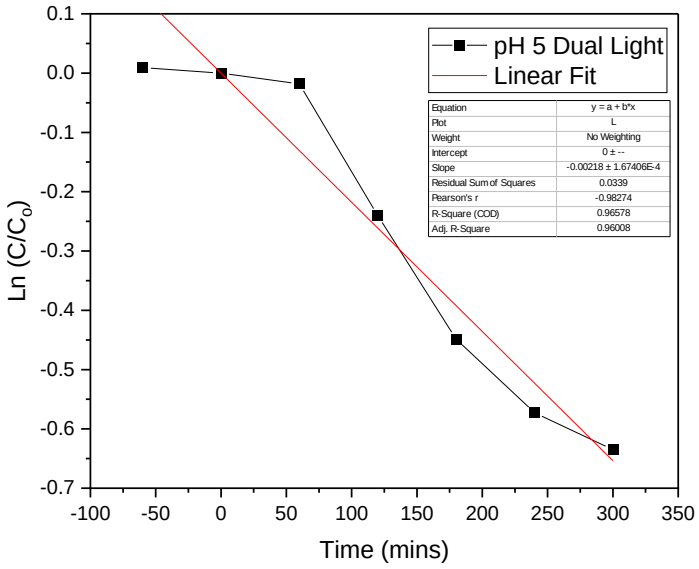

Figure S8. pH5 Dual light linear fit

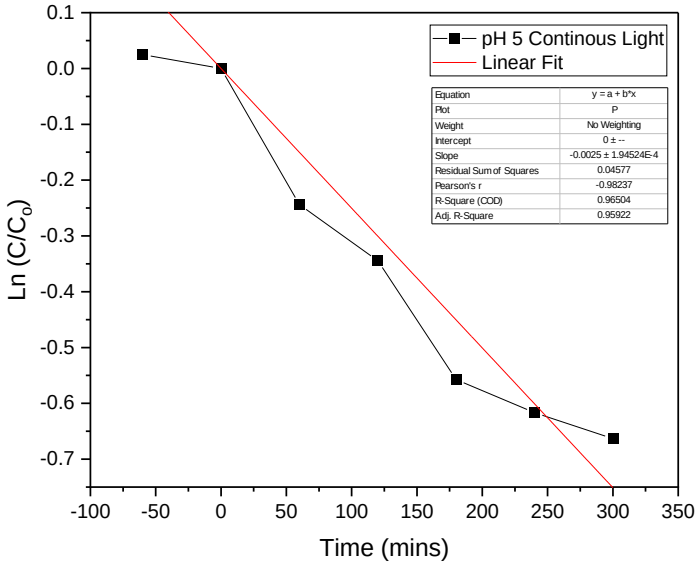

Figure S9. pH5 Continuous light linear fit

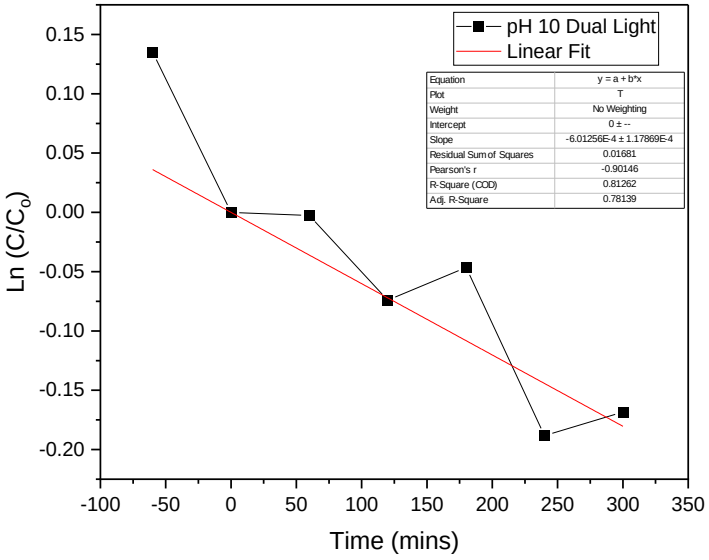

Figure S10. pH10 Dual light linear fit

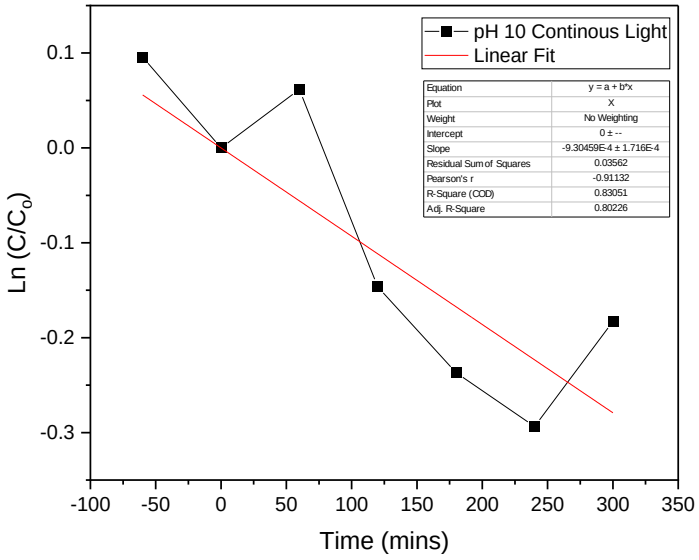

Figure S11. pH10 Continuous light linear fit

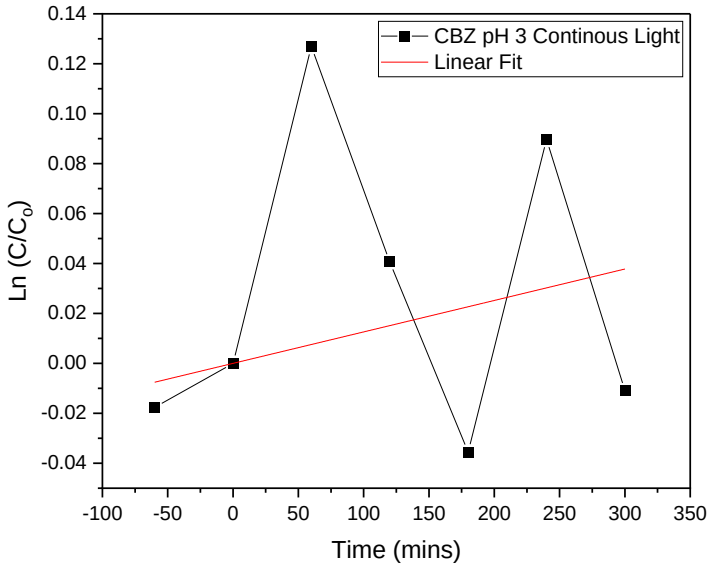

Figure S12. pH 3 Continuous light for CBZ sample linear fit

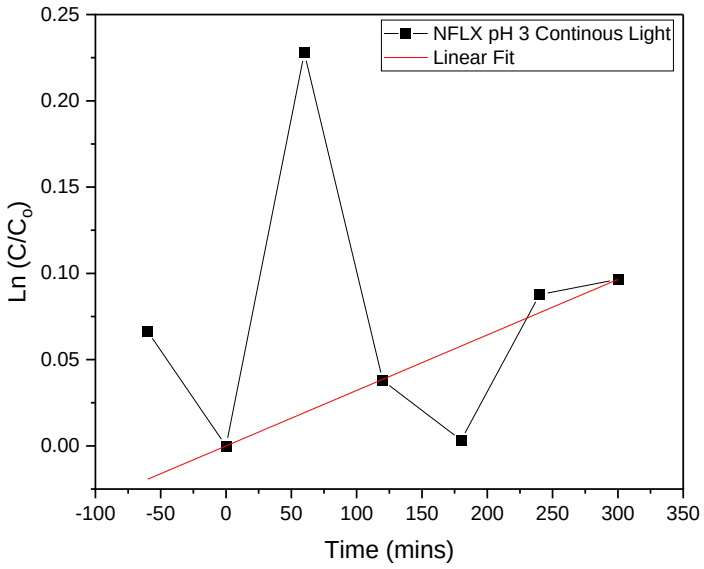

Figure S13. pH 3 Continuous light for NFLX sample linear fit

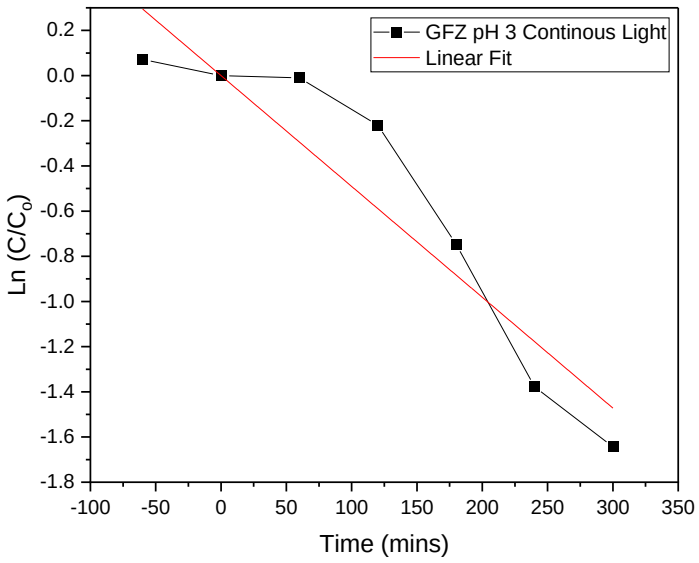

Figure S14. pH 3 Continuous light for GFZ sample linear fit

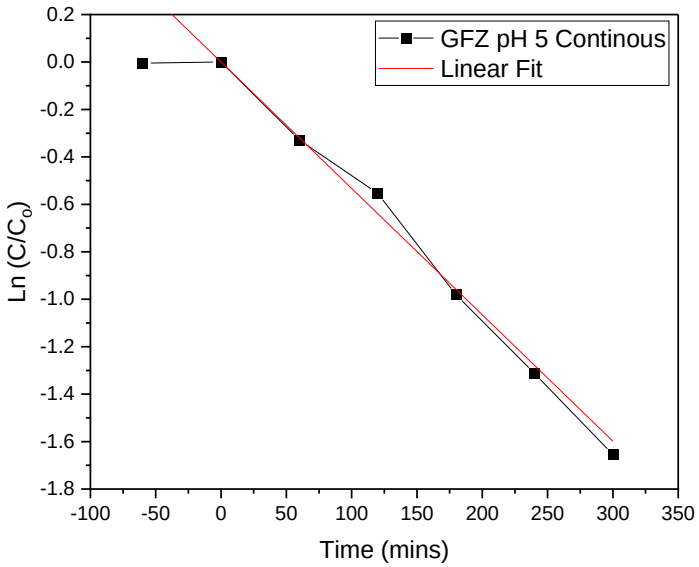

Figure S15. pH 5 Continuous light for GFZ sample linear fit

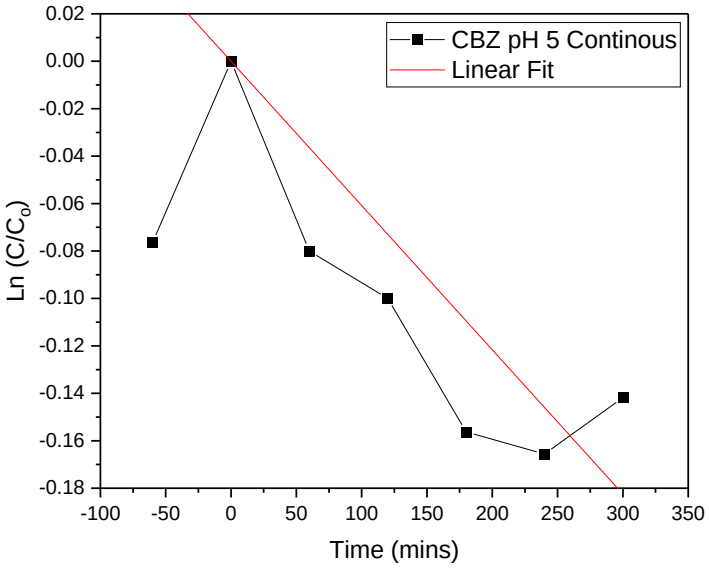

Figure S16. pH 5 Continuous light for CBZ sample linear fit

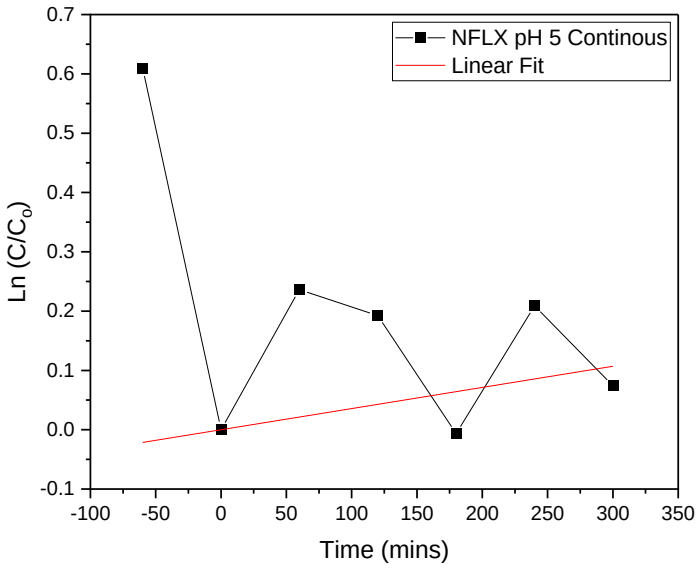

Figure S17. pH 5 Continuous light for NFLX sample linear fit

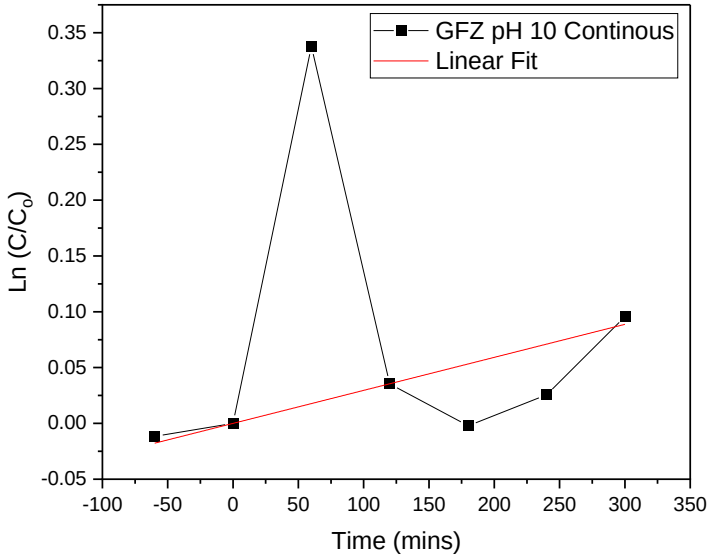

Figure S18. pH 10 Continuous light for GFZ sample linear fit

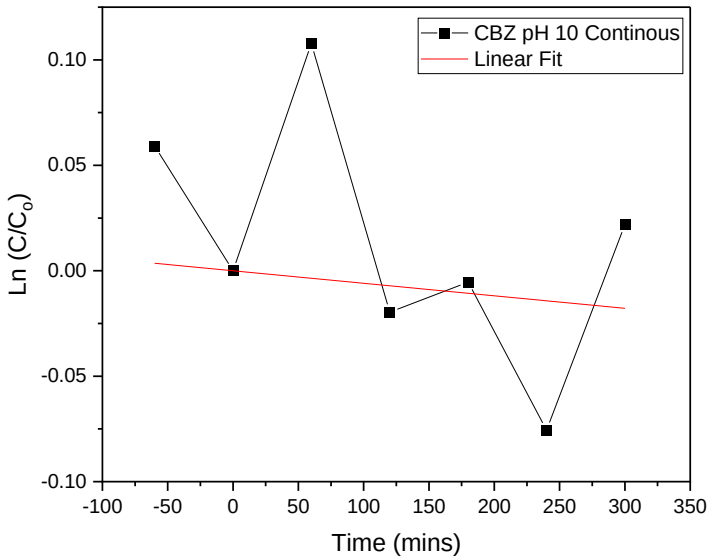

Figure S19. pH 10 Continuous light for CBZ sample linear fit

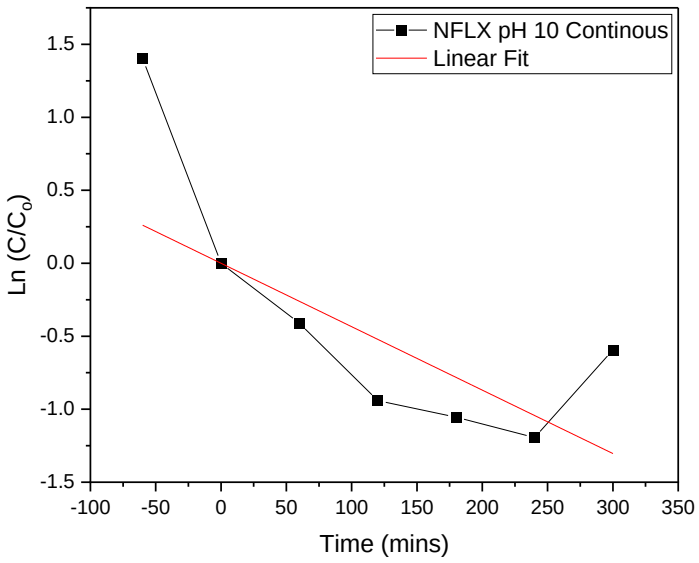

Figure S20. pH 10 Continuous light for NFLX sample linear fit

Pulsed Width Modulation Setup

Pulse width modulation (PWM) with an Adruino Uno connected to an LED Current Driver was used to control the UV-LED (LED Engin, 1 A, λ = 365 nm). This set-up digitally controls a square wave to switch between on (high, 5 volts) and off (low, 0 volts) for different time intervals. The length the LED is switch on at a time is called the pulse width. The dual frequency program switches between two pulse widths, 50Hz and 0.1Hz. Each frequency is repeated the number to times required so an equal amount of time is spent at each. The dual frequency PWM program was coded with the following script:

```
int ledPin = 9;

void setup() {
  pinMode(led, OUTPUT);
}

void loop()
{  digitalWrite(led, HIGH);
  delay(10000);
  digitalWrite(Pin, LOW);
  delay(10000);
{
  For (int x = 0; x < 500; x++)
{
  digitalWrite(led, HIGH);
  delay(20);
  digitalWrite(Pin, LOW);
  delay(20);
}
}}
```