Solar-Powered Electrocoagulation for the Removal of Atrazine with and without Microplastics

Bishwatma Biswas[1], Anju Joshy[1], and Sudha Goel[1]

[1]Environmental Engineering and Management, Department of Civil Engineering, IIT Kharagpur, West Bengal-721302, India

Supplementary file

Table S1 First (k_1) and second order (k_2) kinetic constants and linear correlation coefficient (R^2) values for Al electrode.

Parameters	Range	k_1 (R^2) 10^{-2} min^{-1}	p-value 10^{-3} (First order)	k_2 (R^2) 10^{-2} L/mg. min	p-value 10^{-3} (Second order)
Current density (mA/cm^2)	1	0.43 (0.86)	20.82	0.05 (0.87)	18.94
	3	0.69 (0.90)	12.2	0.09 (0.92)	8.05
	5	0.98 (0.95)	4.69	0.17 (0.95)	3.79
	7	2.04 (0.92)	9.65	0.49 (0.87)	18.37
	10	1.87 (0.92)	8.58	0.51 (0.89)	15.46
ATZ concentration (mg/L)	3	2.29 (0.90)	12.01	1.90 (0.86)	22.3
	5	2.20 (0.95)	4.59	1.20 (0.93)	7.06
	10	1.90 (0.92)	8.58	0.51 (0.89)	15.5
	15	1.65 (0.95)	4.5	0.24 (0.94)	5.84
	20	1.80 (0.96)	3.22	0.20 (0.95)	4.47
Initial pH	3	1.96 (0.92)	9.07	0.45 (0.89)	14.7
	5	2.18 (0.93)	7.53	0.55 (0.90)	13.56
	7	2.10 (0.93)	7.32	0.52 (0.90)	13.18
	9	1.88 (0.93)	6.59	0.43 (0.91)	10.63
	11	1.86 (0.93)	7.65	0.42 (0.90)	13.49
NaCl concentration (mg/L)	100	0.41 (0.97)	1.48	0.05 (0.97)	1.45
	200	0.52 (0.90)	1.28	0.07 (0.91)	11.21
	300	0.81 (0.92)	8.85	0.12 (0.91)	10.51
	400	1.20 (0.93)	6.4	0.22 (0.92)	9.32
	500	2.10 (0.94)	5.43	0.51 (0.91)	11.1

Table S2 First (k_1) and second order (k_2) kinetic constants and linear correlation coefficient (R^2) values for Cu electrode.

Parameters	Range	k_1 (R^2) 10^{-2} min^{-1}	p-value 10^{-3} (First order)	k_2 (R^2) 10^{-2} L/mg. min	p-value 10^{-3} (Second order)
Current density (mA/cm^2)	1	0.43 (0.97)	1.31	0.05 (0.98)	0.63
	3	0.75 (0.98)	0.65	0.11 (0.98)	1.14
	5	1.01 (0.95)	3.45	0.18 (0.96)	2.28
	7	2.29 (0.94)	4.84	0.62 (0.91)	10.42
	10	2.03 (0.92)	8.64	0.63 (0.88)	16.6
ATZ concentration (mg/L)	3	2.39 (0.90)	12.46	2.07 (0.85)	24.03
	5	2.30 (0.95)	4.21	1.34 (0.94)	5.67
	10	2.10 (0.93)	6.53	0.67 (0.9)	12.16
	15	1.70 (0.95)	4.26	0.26 (0.96)	2.66
	20	1.79 (0.96)	2.56	0.20 (0.95)	3.69
Initial pH	3	2.02 (0.93)	7.62	0.48 (0.90)	12.63
	5	2.22 (0.93)	7.97	0.56 (0.89)	14.59
	7	2.17 (0.92)	8.84	0.72 (0.88)	17.04
	9	1.91 (0.93)	6.72	0.44 (0.91)	10.67
	11	1.90 (0.93)	7.12	0.44 (0.90)	12.86
NaCl concentration (mg/L)	100	0.45 (0.95)	3.99	0.06 (0.95)	3.53
	200	0.60 (0.95)	4.69	0.09 (0.95)	3.75
	300	0.91 (0.93)	7.98	0.15 (0.92)	9.41
	400	1.30 (0.95)	4.75	0.25 (0.93)	6.81
	500	2.30 (0.94)	4.96	0.62 (0.91)	10.64

Table S3 Recovery test of the developed HPLC analysis method (n=3).

Water Matrix	**Standard spiked (mg/L)**	**Found (mg/L)**	**Recovery (%)**	**Average recovery (%)**
Ground water	5	4.59	91.95	98.75
	10	10.35	103.47	
	15	15.13	100.84	
Lake water	5	4.72	94.35	102.87
	10	11.09	110.89	
	15	15.51	103.39	
River water	5	4.974	99.44	104.25
	10	11.06	110.62	
	15	15.40	102.69	
Wastewater	5	4.90	98.05	101.84
	10	10.31	103.05	
	15	15.66	104.42	

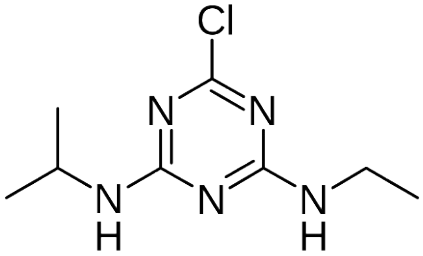

Fig. S1 *Molecular structure of atrazine.*

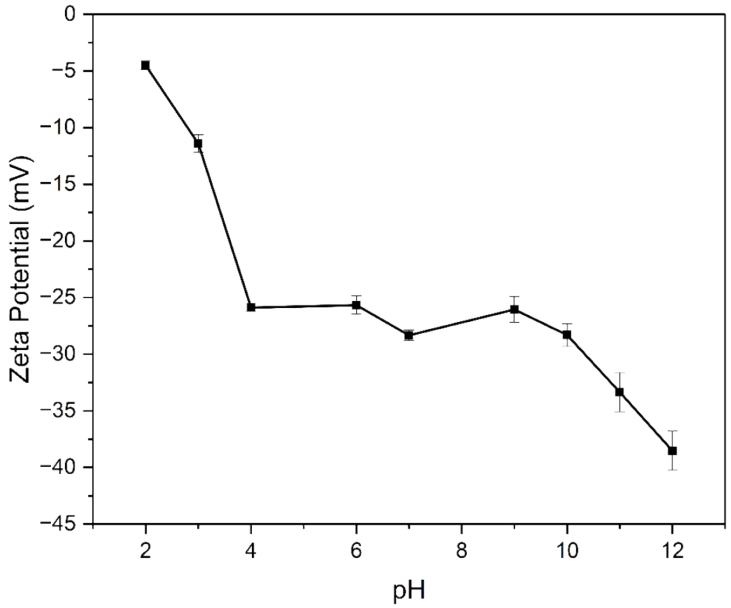

Fig. S2 Zeta potential of ATZ solution.

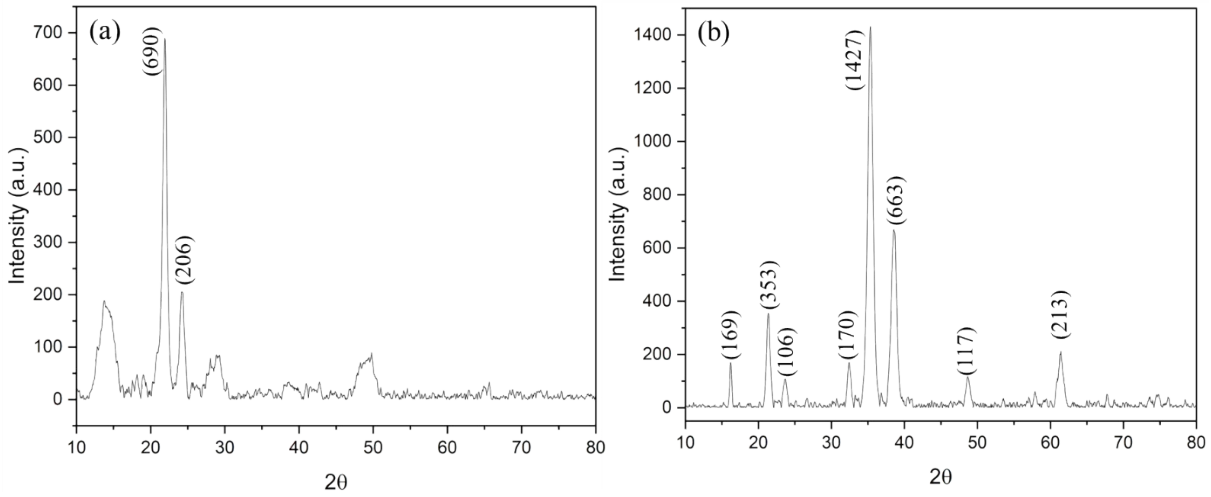

Fig. S3 XRD spectrum of sludge containing MPs generated from (a) Al-Al electrodes, and (b) Cu-Cu electrodes.