coatings

Supplementary Materials: Sonophotocatalytic Degradation of Malachite Green by Nanocrystalline Chitosan-Ascorbic Acid@$NiFe_2O_4$ Spinel Ferrite

Imran Hasan [1], Akshara Bassi [1], Khadijah H. Alharbi [2], Ibtisam I BinSharfan [3], Rais Ahmad Khan [3] and Ali Alslame [3,*]

[1] Environmental Research Laboratory, Department of Chemistry, Chandigarh University, Gharuan, Mohali, Punjab 140301, India; imranhasan98@gmail.com (I.H.); bassiakshara@gmail.com (A.B.)
[2] Department of Chemistry, Science and Arts College, Rabigh Campus, King Abdulaziz University, Jeddah 21911, Saudi Arabia; khalharbe@kau.edu.sa
[3] Department of Chemistry, College of Science, King Saud University, Riyadh 11451, Saudi Arabia; 437202977@ksu.edu.sa (I.I.B.); krais@ksu.edu.sa (R.A.K.)
* Correspondence: aalsalme@ksu.edu.sa

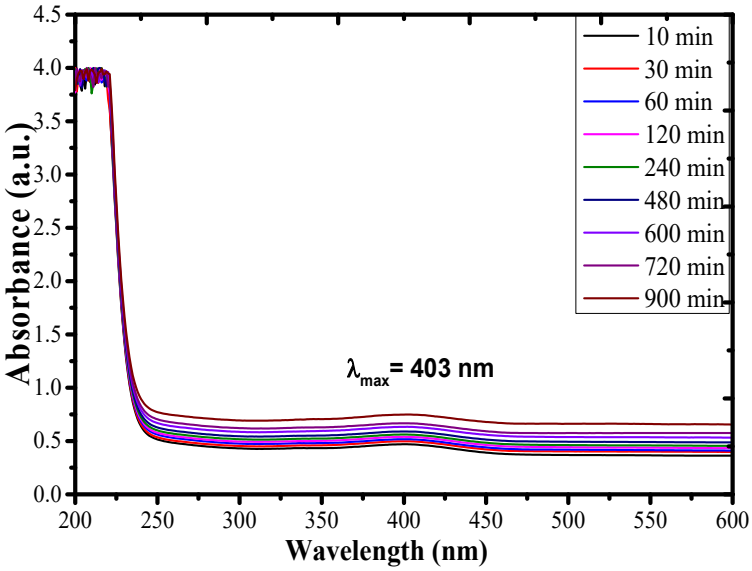

Figure S1. UV-Vis Spectra with time profile to observe the growth of $NiFe_2O_4$ spinel nuclei under the influence of CT-AS biopolymer blend.

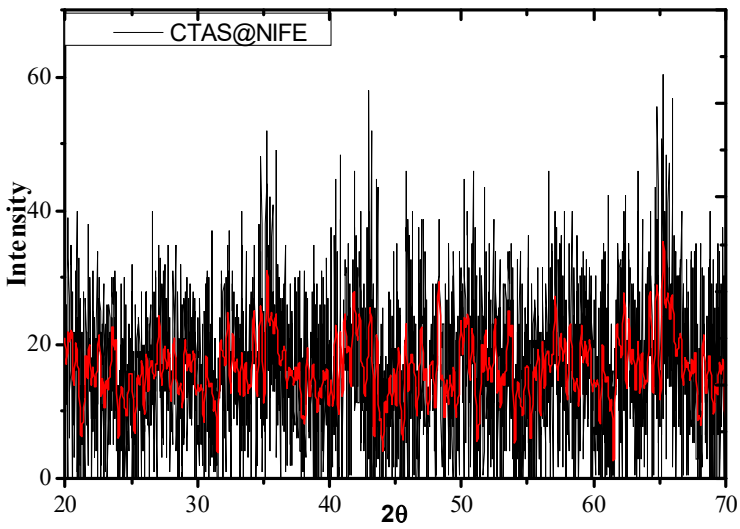

Figure S2. XRD spectra CTAS@NIFE nanocomposite.

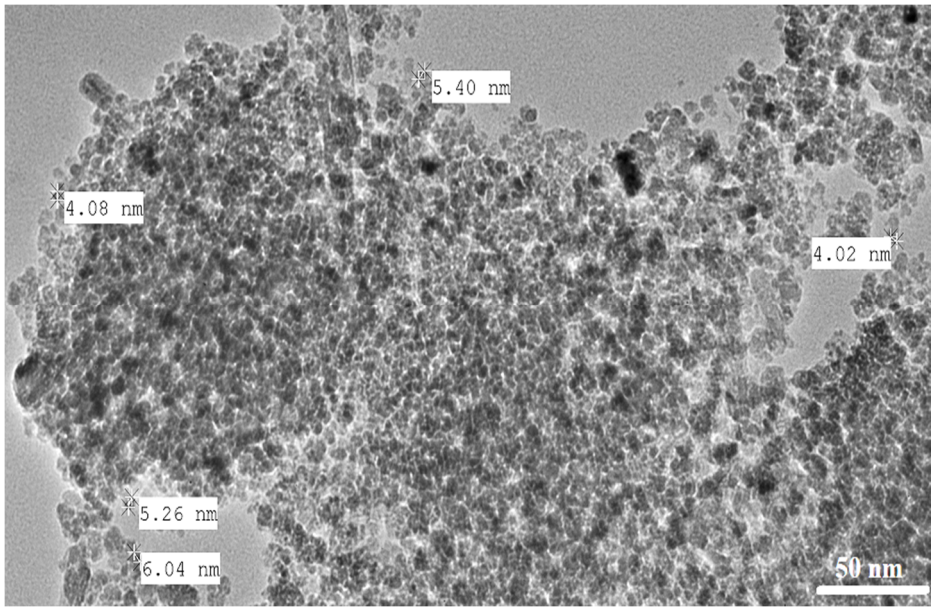

Figure S3. TEM image of CTAS@NIFE bio nanocomposite at 50 nm magnification.

Table S1. Concentration vs. percent degradation data with standard deviation for MG degradation using 20 mg catalyst under 6.35 W·mL^{-1} ultrasonic power.

S.N.	MG Concentration (mg·L^{-1})	% Degradation values
1	10.00	86.57 ± 5.79
2	15.00	92.42 ± 0.06
3	20.00	88.64 ± 3.72
4	25.00	90.08 ± 2.28
5	30.00	82.44 ± 9.92
6	35.00	94.69 ± 2.33
7	40.00	94.32 ± 1.96
8	45.00	93.11 ± 0.75
9	50.00	94.63 ± 2.27
10	55.00	96.81 ± 4.45
11	60.00	95.35 ± 2.99
12	65.00	94.44 ± 2.08
13	70.00	97.20±4.84

Table S2. Ce/Co values with standard deviation with respect to variable pH conditions for MG degradation using 20 mg catalyst under 6.35 W·mL^{-1} ultrasonic power.

S.N.	pH of the solution	Ce/Co value		
		35 mg·L^{-1} MG	55 mg·L^{-1} MG	70 mg·L^{-1} MG
1	1.00	0.124 ± 0.085	0.135 ± 0.082	0.097 ± 0.053
2	2.00	0.065 ± 0.026	0.111 ± 0.058	0.077 ± 0.032
3	3.00	0.041 ± 0.002	0.098 ± 0.045	0.069 ± 0.025
4	4.00	0.027 ± 0.012	0.028 ± 0.025	0.066 ± 0.022
5	5.00	0.018 ± 0.021	0.023 ± 0.030	0.019 ± 0.025
6	6.00	0.015 ± 0.024	0.017 ± 0.036	0.013 ± 0.031
7	7.00	0.012 ± 0.027	0.011 ± 0.042	0.012 ± 0.033
8	8.00	0.011 ± 0.028	0.001 ± 0.052	0.001 ± 0.043

Table S3. Ce/Co values with standard deviation with respect to variable pH conditions for MG degradation using 20 mg catalyst under 6.35 W·mL^{-1} ultrasonic power.

S.N.	Irradiation Time (min)	Ce/Co value		
		35 mg·L^{-1} MG	55 mg·L^{-1} MG	70 mg·L^{-1} MG
1	5	0.044 ± 0.017	0.041 ± 0.018	0.012 ± 0.001
2	15	0.035 ± 0.008	0.032 ± 0.009	0.011 ± 0.002
3	30	0.024 ± 0.003	0.021 ± 0.002	0.011 ± 0.002
4	45	0.024 ± 0.003	0.021 ± 0.002	0.011 ± 0.002
5	60	0.021 ± 0.006	0.019 ± 0.004	0.011 ± 0.001
6	75	0.021 ± 0.006	0.014 ± 0.009	0.010 ± 0.002
7	90	0.018 ± 0.009	0.014 ± 0.003	0.009 ± 0.001

Table S4. Ultrasonic power vs. % MG degradation with standard deviation data for MG degradation using 20 mg catalyst at 90 min of irradiation, pH 8 for 35, 55 and 70 mg·L^{-1} MG concentration.

S.N.	Ultrasonic Power (W·mL^{-1})	% MG Degradation		
		35 mg·L^{-1} MG	55 mg·L^{-1} MG	70 mg·L^{-1} MG
1	4.85	87.77 ± 7.62	92.54 ± 2.85	95.34 ± 0.05
2	5.05	97.25 ± 1.86	98.13 ± 2.74	98.57 ± 3.18
3	5.85	98.17 ± 2.78	98.94 ± 3.55	99.16 ± 3.77
4	6.35	98.37 ± 2.98	99.35 ± 3.96	99.94 ± 4.55

Table S5. -Ln (Ce/Co) values with standard deviation with respect to irradiation time for pseudo first order kinetics for 35, 55 and 70 mg L^{-1} MG concentration using 20 mg catalyst at pH 8 and 6.35 W·mL^{-1} ultrasonic power.

S.N.	Irradiation Time (min)	-Ln (Ce/Co)		
		35 mg·L^{-1} MG	55 mg·L^{-1} MG	70 mg·L^{-1} MG
1	5	3.117 ± 0.522	3.186 ± 0.622	4.390 ± 0.136
2	15	3.271 ± 0.368	3.384 ± 0.424	4.490 ± 0.036
3	30	3.456 ± 0.183	3.660 ± 0.149	4.490 ± 0.036
4	45	3.686 ± 0.047	3.880 ± 0.071	4.531 ± 0.005
5	60	3.830 ± 0.191	4.015 ± 0.207	4.531 ± 0.005
6	75	3.980 ± 0.341	4.230 ± 0.421	4.587 ± 0.061
7	90	4.134 ± 0.495	4.303 ± 0.495	4.662 ± 0.136

Table S6. 1/Ce values with standard deviation with respect to irradiation time for pseudo second order kinetics for 35, 55 and 70 mg·L^{-1} MG concentration using 20 mg catalyst at pH 8 and 6.35 W·mL^{-1} ultrasonic power.

S.N.	Irradiation Time (min)	1/Ce		
		35 mg·L^{-1} MG	55 mg·L^{-1} MG	70 mg·L^{-1} MG
1	5	0.645 ± 0.533	0.440 ± 0.474	1.152 ± 0.172
2	15	0.807 ± 0.372	0.569 ± 0.345	1.274 ± 0.050
3	30	1.210 ± 0.031	0.880 ± 0.034	1.274 ± 0.050
4	45	1.210 ± 0.031	0.880 ± 0.034	1.326 ± 0.002
5	60	1.383 ± 0.204	0.958 ± 0.044	1.326 ± 0.002
6	75	1.383 ± 0.204	1.326 ± 0.412	1.403 ± 0.079
7	90	1.613 ± 0.435	1.344 ± 0.430	1.513 ± 0.189