Supplementary Materials

Kinetic and Mechanistic Study of Rhodamine B Degradation by H_2O_2 and $Cu/Al_2O_3/g\text{-}C_3N_4$ Composite

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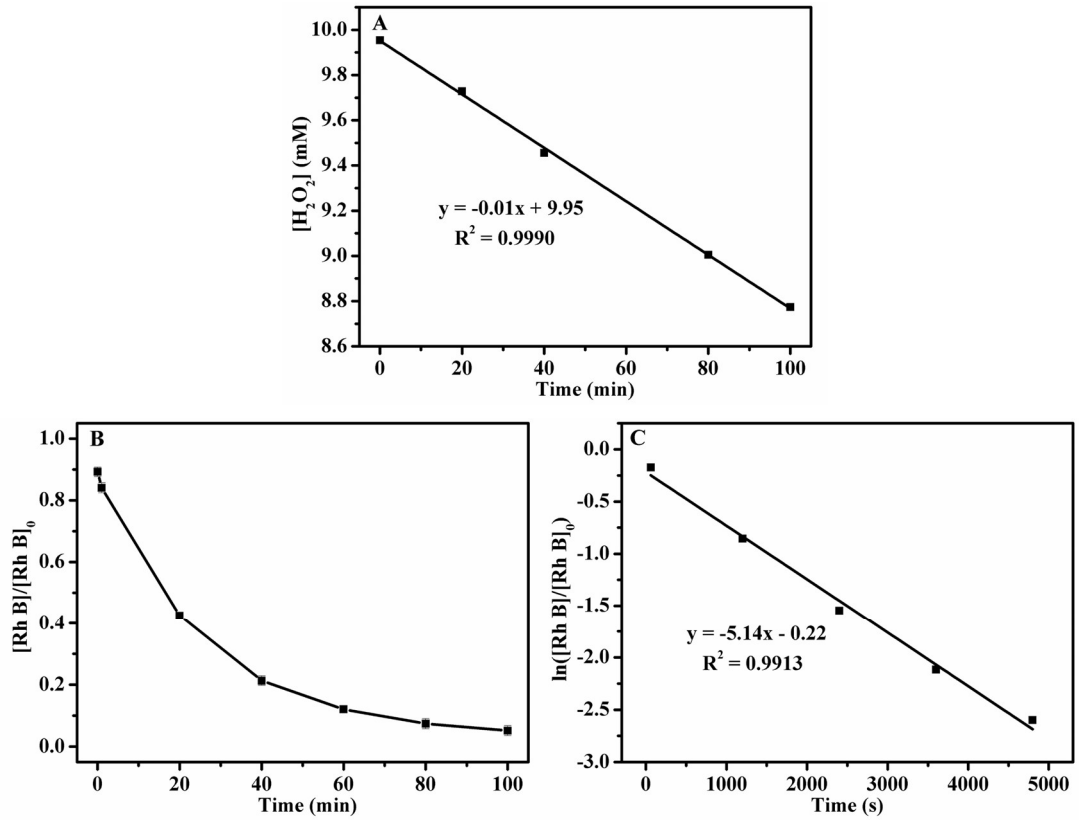


Figure S1. (A) $[H_2O_2]$, (B) $[Rh\ B]/[Rh\ B]_0$, and (C) $\ln([Rh\ B]/[Rh\ B]_0)$ as a function of time in the presence of 1 g/L $Cu/Al_2O_3/CN$ composite at room temperature. Reaction conditions: $[Rh\ B]_0$ = 20 mg/L, $[H_2O_2]_0$ = 10 mM, V = 100 mL, pH 4.9 (unadjusted).

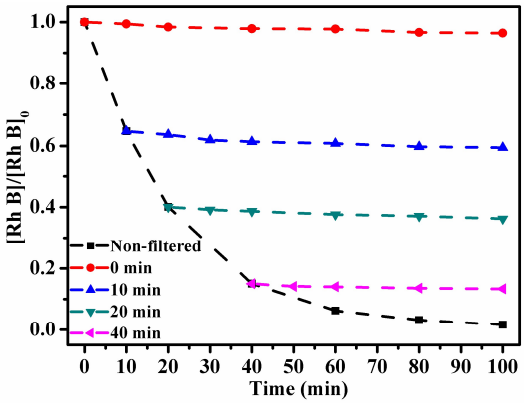


Figure S2. $[Rh\ B]/[Rh\ B]_0$ as a function of time in nonfiltered $Cu/Al_2O_3/CN$ suspension and filtrates obtained at selected time intervals. Reaction conditions: [catalyst] = 1g/L, $[Rh\ B]_0$ = 20 mg/L, $[H_2O_2]_0$ = 10 mM, V = 100 mL, 25°C, pH 4.9 (unadjusted).

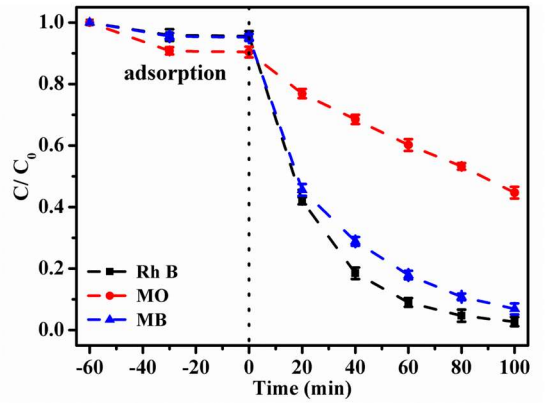


Figure S3. C/C_0 as a function of time with different organic pollutants in the presence of 1 g/L $Cu/Al_2O_3/CN$ composite. Reaction conditions: [dye] = 20 mg/L, $[H_2O_2]_0$ = 10 mM, V = 100 mL, 25°C, pH 4.9 (unadjusted).

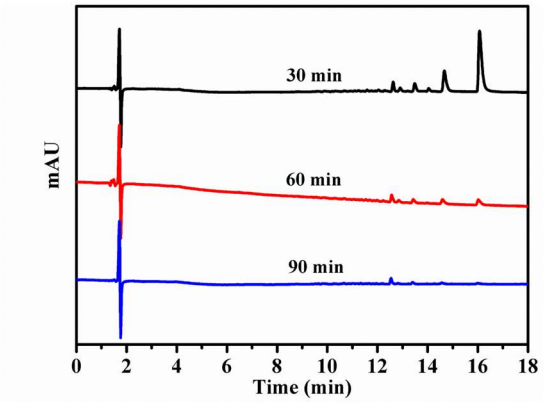
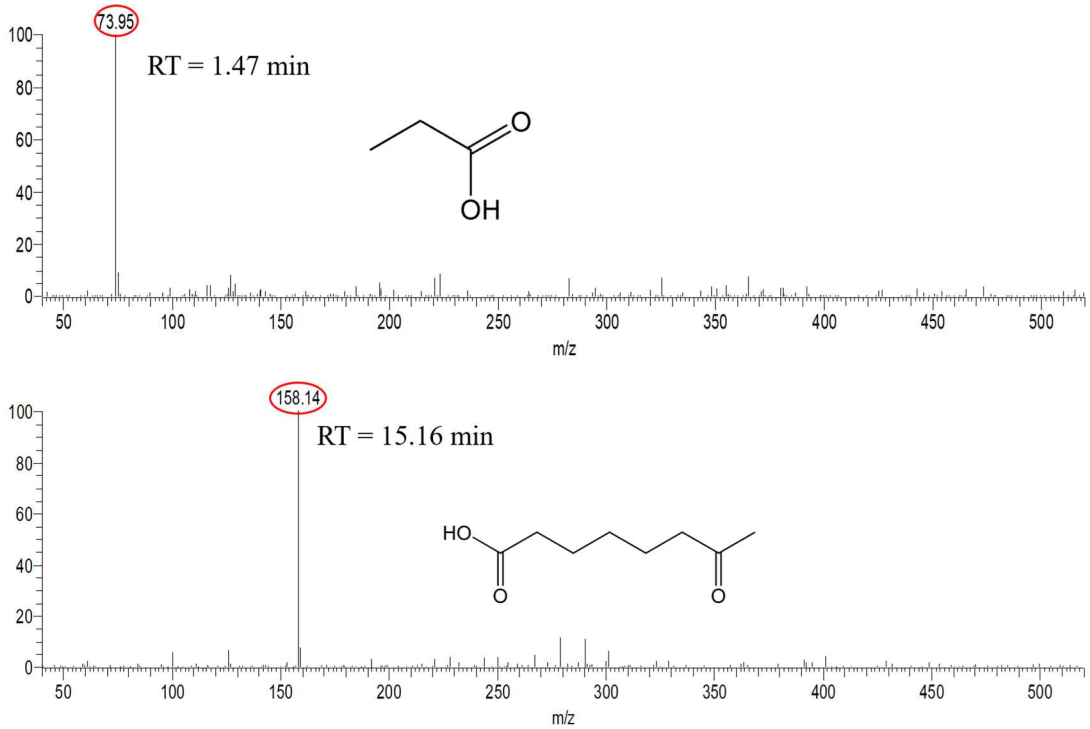
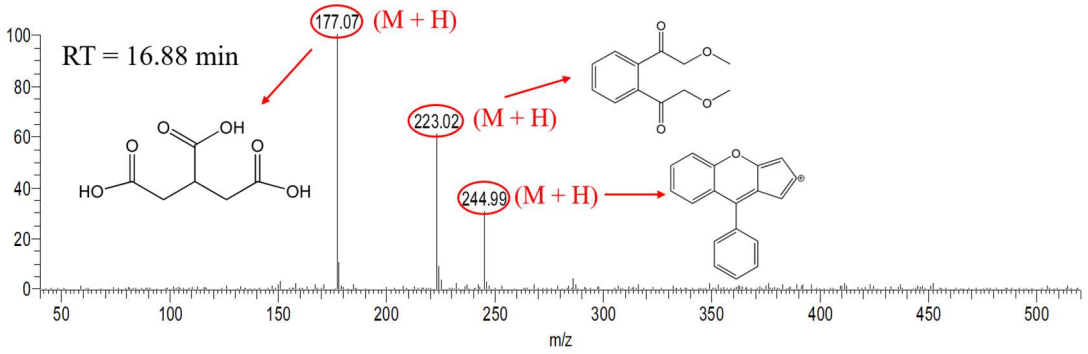
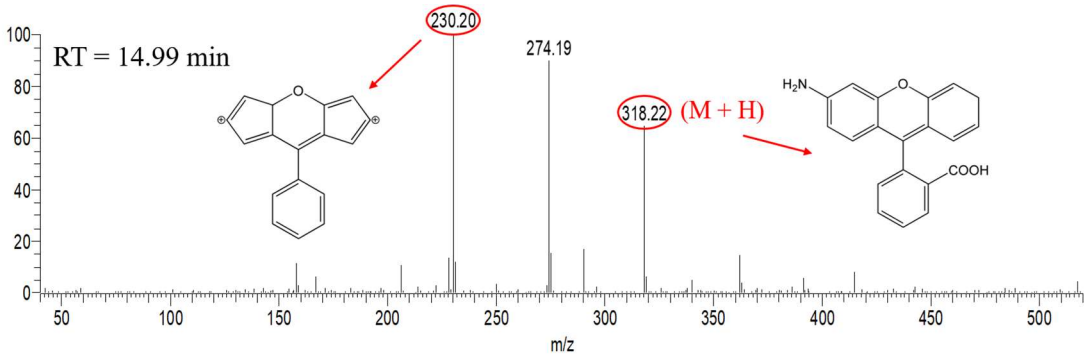
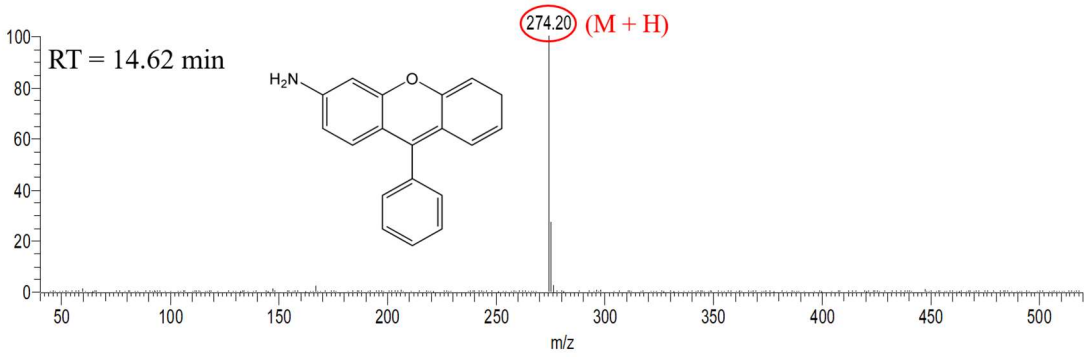


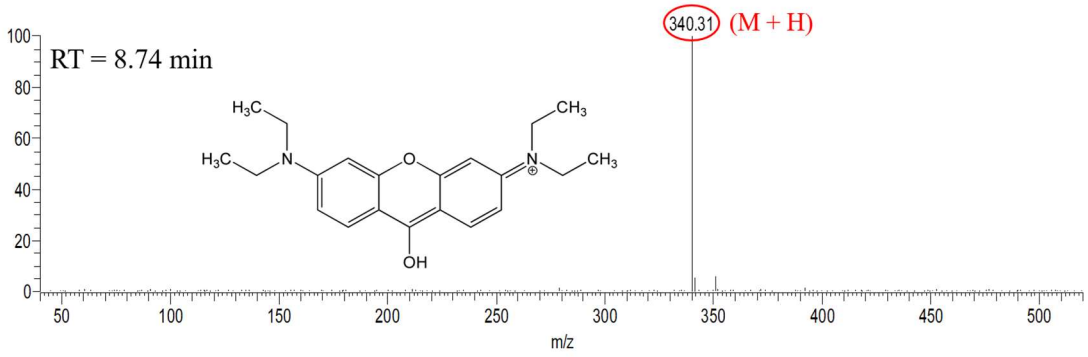
Figure S4. HPLC chromatograms of samples extracted at different reaction times in Rh B degradation. Reaction conditions: [catalyst] = 1g/L, [dye] = 20 mg/L, $[H_2O_2]_0$ = 10 mM, V = 100 mL, 25°C, pH 4.9 (unadjusted).

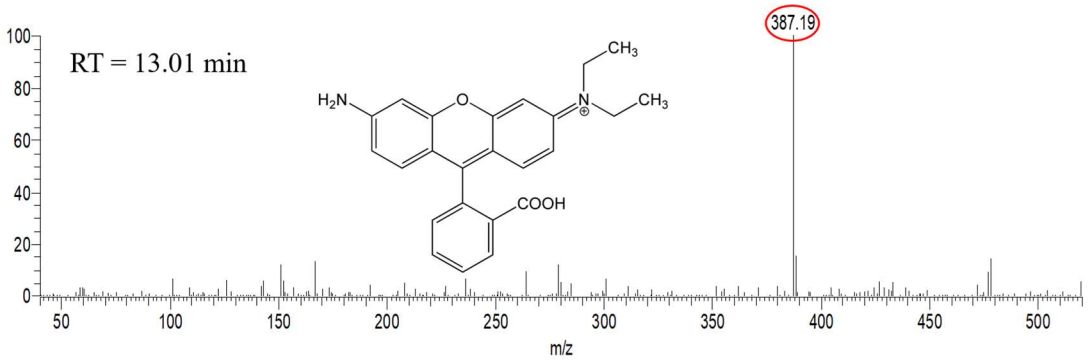



RT = 16.88 min
177.07 (M + H)
223.02 (M + H)
244.99 (M + H)
m/z


RT = 14.99 min
230.20
274.19
318.22 (M + H)
m/z


RT = 14.62 min
274.20 (M + H)
m/z


RT = 8.74 min
340.31 (M + H)
m/z


RT = 13.01 min
387.19
m/z

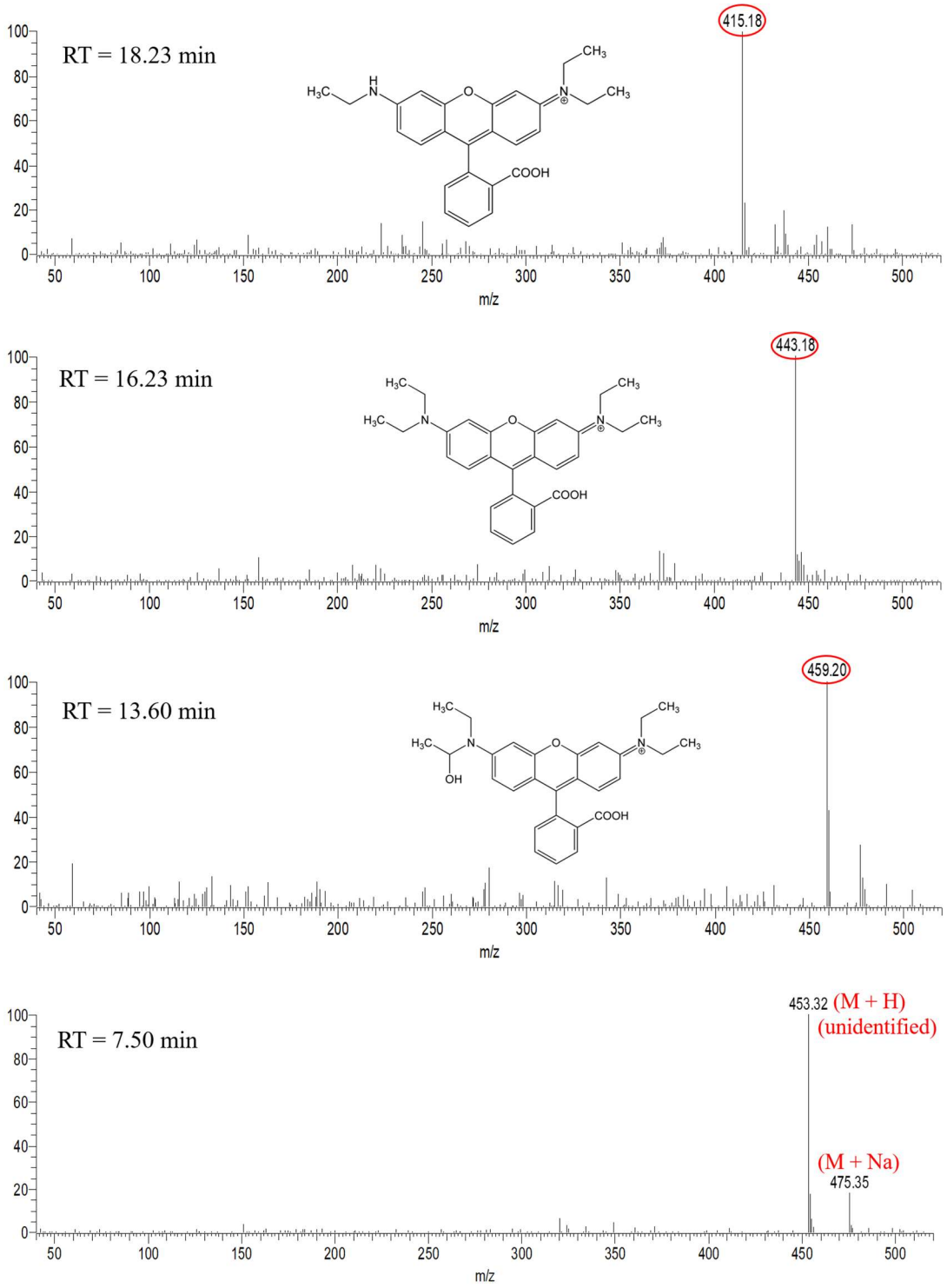


Figure S5. Mass spectra of the degradation products in the sample extracted at 60 min in Rh B degradation.

Table S1. Comparison of the catalytic activities of $Cu/Al_2O_3/CN$ composite with other copper-based Fenton-like catalysts

Catalyst	SSA (m^2/g)	[cata] (g/L)	[Rh B] (mg/L)	[H_2O_2] (mM)	pH	T (°C)	Time (min)	Degradation Ratio (%)	k_{obs} (min^{-1})	Cu leaching (ppm)	Ref
$Cu/Al_2O_3/CN$	146.6	1	20	10	unadjusted	25	100	96.4	0.039	0.16	This work
CuO (nanowires)	14.29	0.2	10	14.1	unadjusted	35	280	92	0.0098	N/A	[63]
CuO (nanoparticles)	10.66	0.2	10	14.1	unadjusted	35	280	61	0.0036	N/A	[63]
CuO (nanorods)	10.78	0.2	10	14.1	unadjusted	35	280	86	0.007	N/A	[63]
CuO (nanopetals)	8.4	0.2	200	1633	unadjusted	25	5	85	0.006	N/A	[64]
CuO (nanoflowers)	5.5	0.2	200	1633	unadjusted	25	5	81	0.0055	N/A	[64]
CuO (commercial)	1.7	0.2	200	1633	unadjusted	25	5	14	0.0004	N/A	[64]
Fe-g-C_3N_4/GMC	370.5	0.8	50	40	unadjusted	N/A	40	98	0.1837	1.04	[69]
5Cu/Al_2O_3-750	147.6	1	10	1000	5.14	50	30	98.53	0.14	0.45	[48]
Cu@SiO_2-R200	N/A	0.5	10	29.4	neutral	60	10	95	0.242	0.07	[73]
Cu doped $LaTiO_3$	8.5	1.4	8	40	4	N/A	120	94	N/A	1.4	[27]
Cu-g-C_3N_4	N/A	0.2	10	300	neutral	N/A	15	92.3	N/A	N/A	[70]
Cu-Al_2O_3-g-C_3N_4	284.1	0.5	10	12.5	neutral	N/A	100	98	N/A	0.25	[40]
Cu/g-C_3N_4	27.18	0.8	50	40	neutral	25	60	99.2	N/A	1.18	[71]
Cu-Mn/CeO_2/SBA-15	286	0.2	2000	400	3	70	210	99	N/A	N/A	[72]

SSA: specific surface area.

N/A: not available.