Support Materials

Oxygen Doped Graphitic Carbon Nitride Nanosheets for the Degradation of Organic Pollutants by Activating Hydrogen Peroxide in the Presence of Bicarbonate in the Dark

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Figure S1

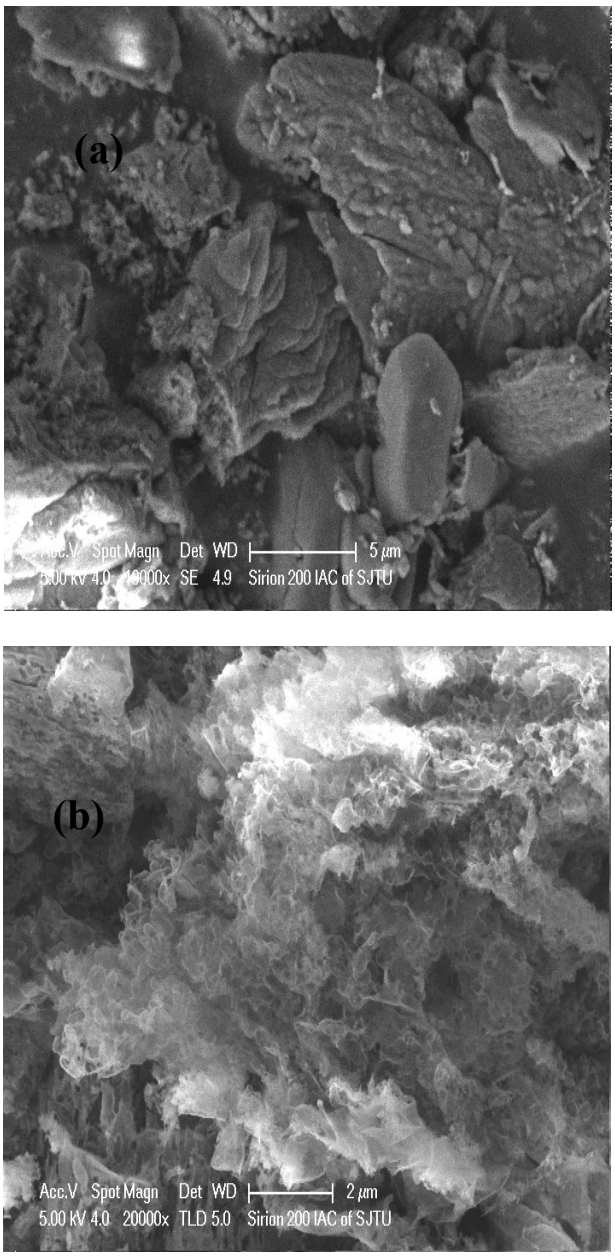
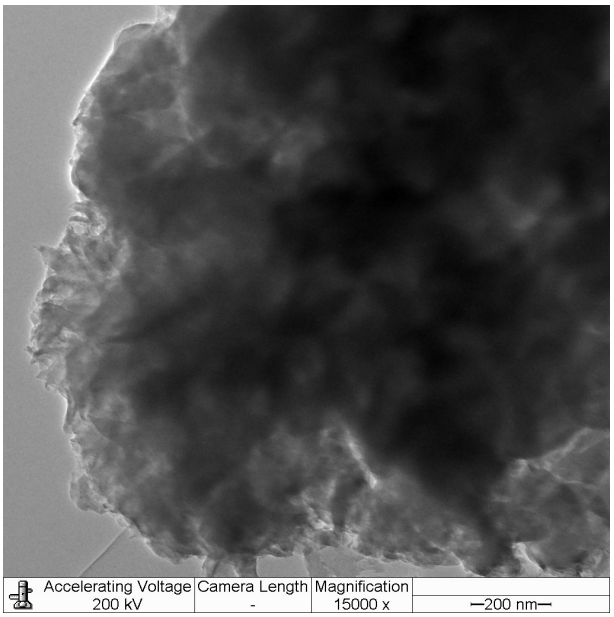


Figure S1 The SEM images of different catalysts.

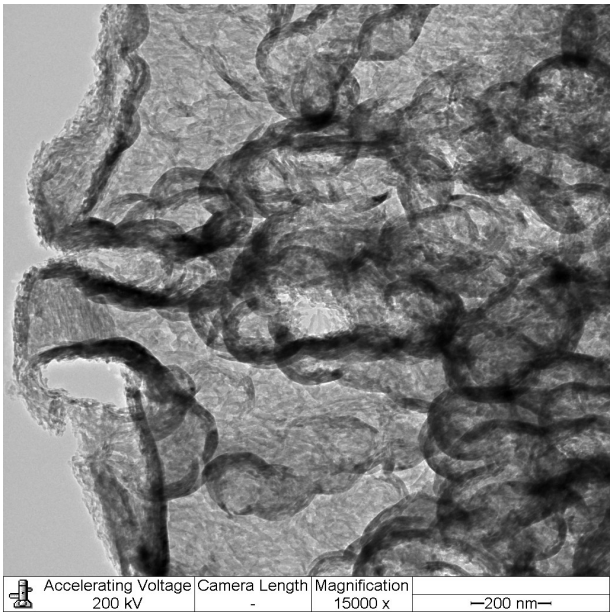
(a) g-C_3N_4, (b) O/g-C_3N_4.

Figure S2

(a)



(b)



(b) Figure S2 The TEM images of different catalysts.

(a) g-C_3N_4, (b) O/g-C_3N_4.

Figure S3

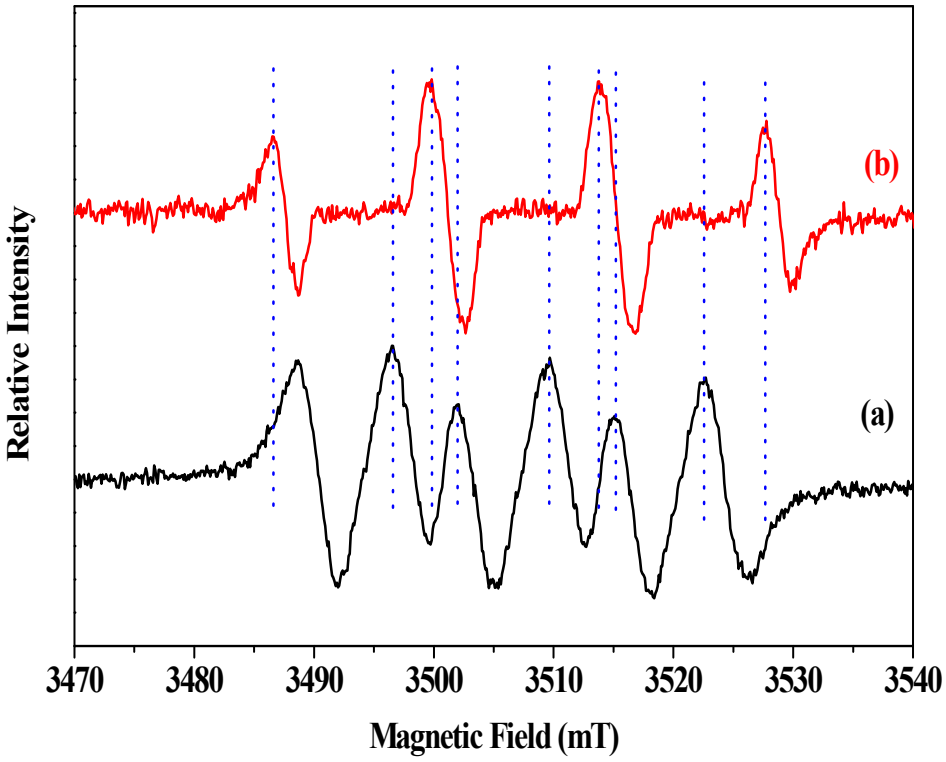


Figure S3 The EPR spectra of different catalysts.

(a) g-C_3N_4, (b) O/g-C_3N_4.

Figure S4

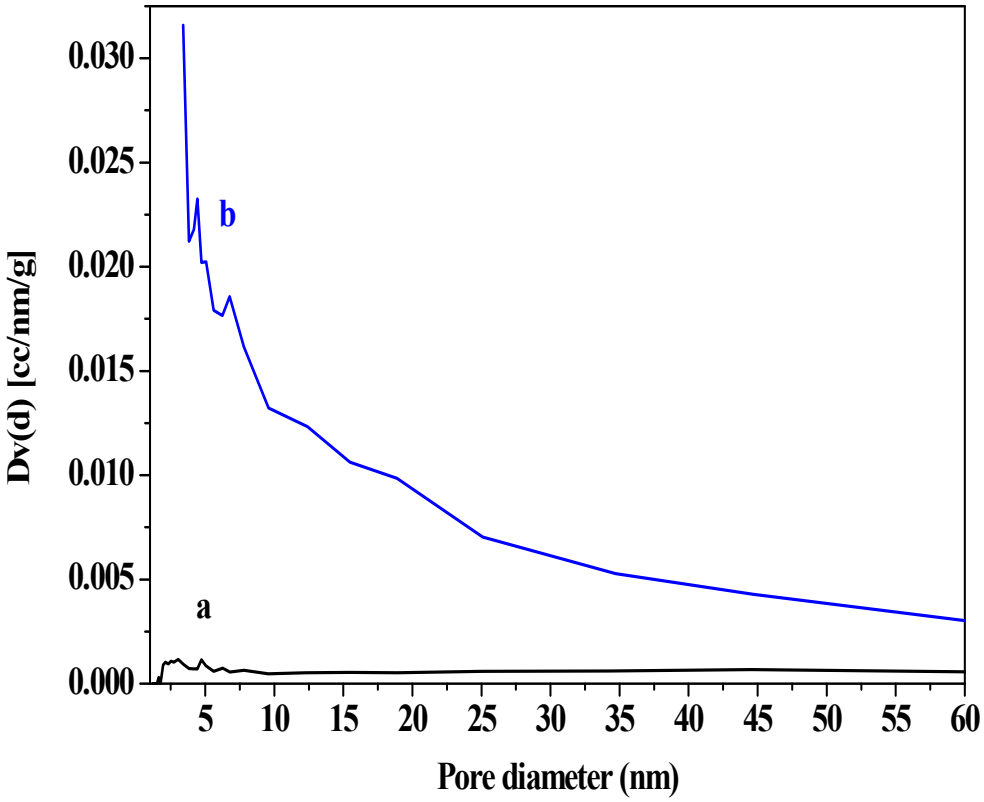


Figure S4 The pore size distributions of different catalysts (BJH method).

(a) g-C_3N_4, (b) O/g-C_3N_4.

Figure S5

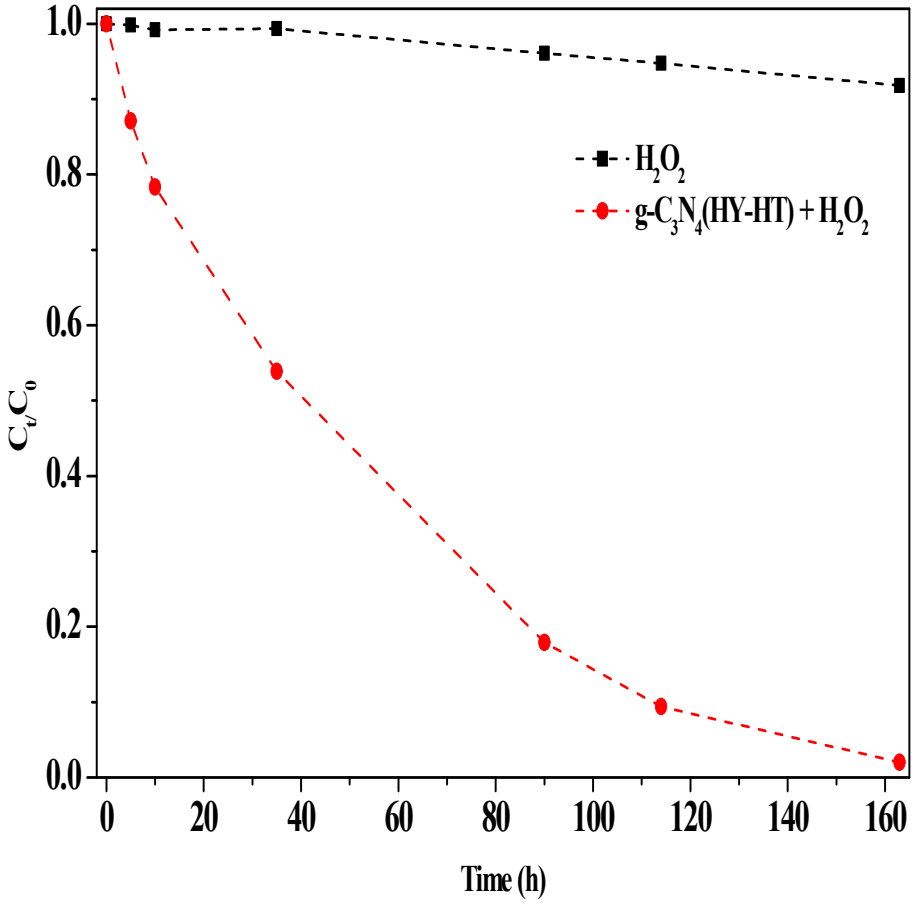


Figure S5 Effect of reaction time on the removal of RhB in the dark. Conditions: $[RhB]_0 = 10$ mg L^{-1}, $[H_2O_2] = 36$ mM, [Catal.] = 0.1 g L^{-1}, initial pH no adjustment and 25 ^oC.

Figure S6

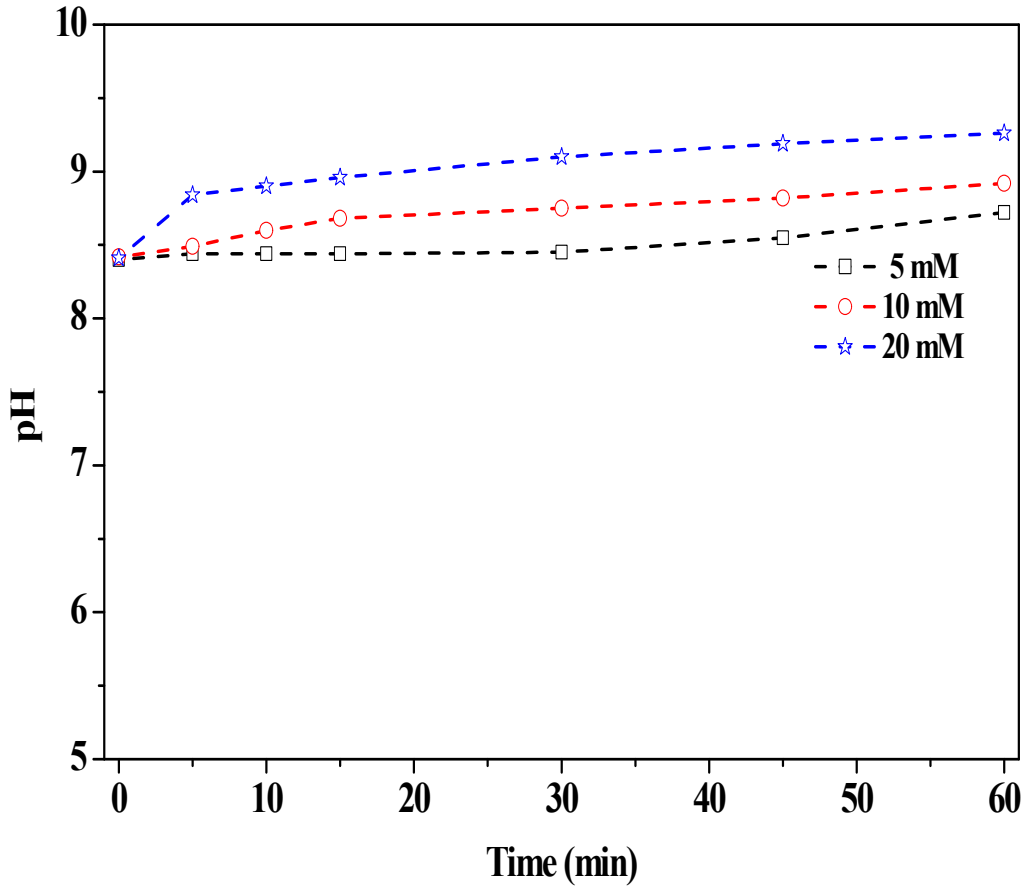


Figure S6 The change of solution pH with HCO_3^- concentration during reaction. Reaction conditions: $[H_2O_2]$ = 36 mM, $[O/g\text{-}C_3N_4]$ = 1.0 g L^{-1}, [RhB] = 10 mg L^{-1}, 25°C and 60 min.

Figure S7

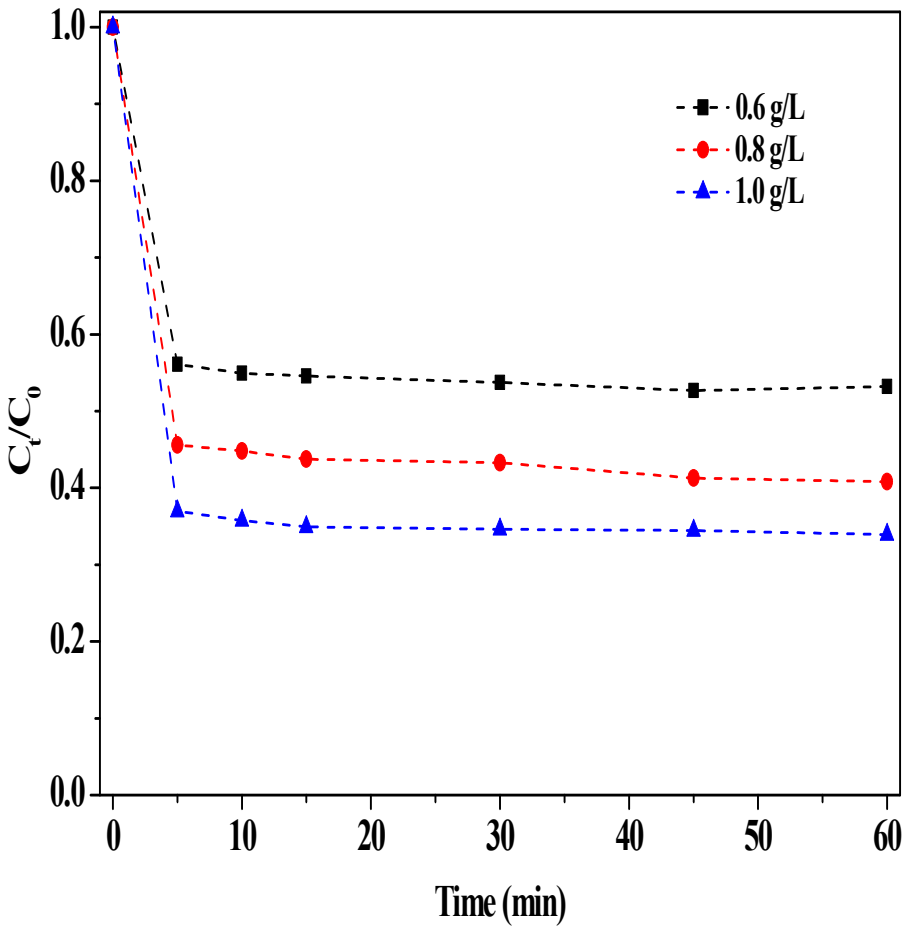


Figure S7 The effect of the mass of catalyst on the removal of RhB through the absorption. Reaction conditions: [RhB] = 10 mg L^{-1}, 25°C and 60 min, [O/g-C_3N_4] = 0.6 g L^{-1}, 0.8 g L^{-1} and 1.0 g L^{-1}, respectively.

Figure S8

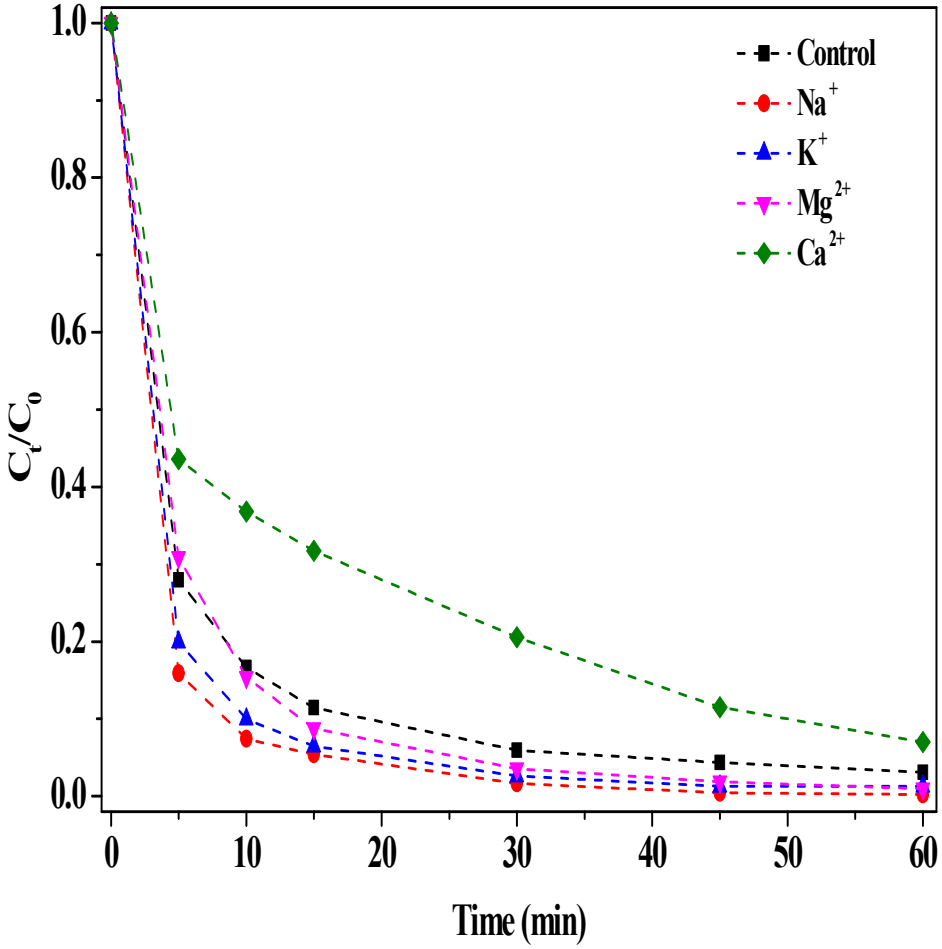


Figure S8 Effect of various metal ions on the RhB degradation. Reaction conditions: [$NaHCO_3$] = 10 mM, [H_2O_2] = 15 mM, [O/g-C_3N_4] = 0.8 g L^{-1}, [Metal ions] = 100 mM, [RhB] = 10 mg L^{-1}, 25 °C, pH ≈ 8.4 and 60 min.

Figure S9

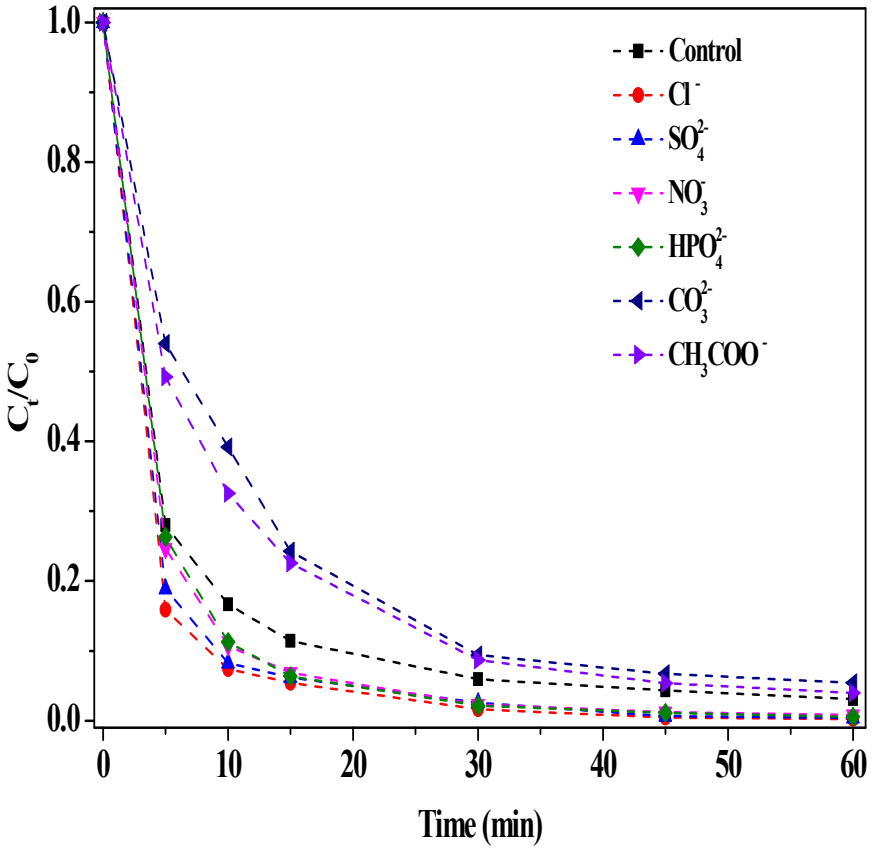


Figure S9 Effect of various anions on the RhB degradation. Reaction conditions: [$NaHCO_3$] = 10 mM, [H_2O_2] = 15 mM, [O/g-C_3N_4] = 0.8 g L^{-1}, [Anions] = 100 mM, [RhB] = 10 mg L^{-1}, 25 °C, pH ≈ 8.4 and 60 min.

Figure S10

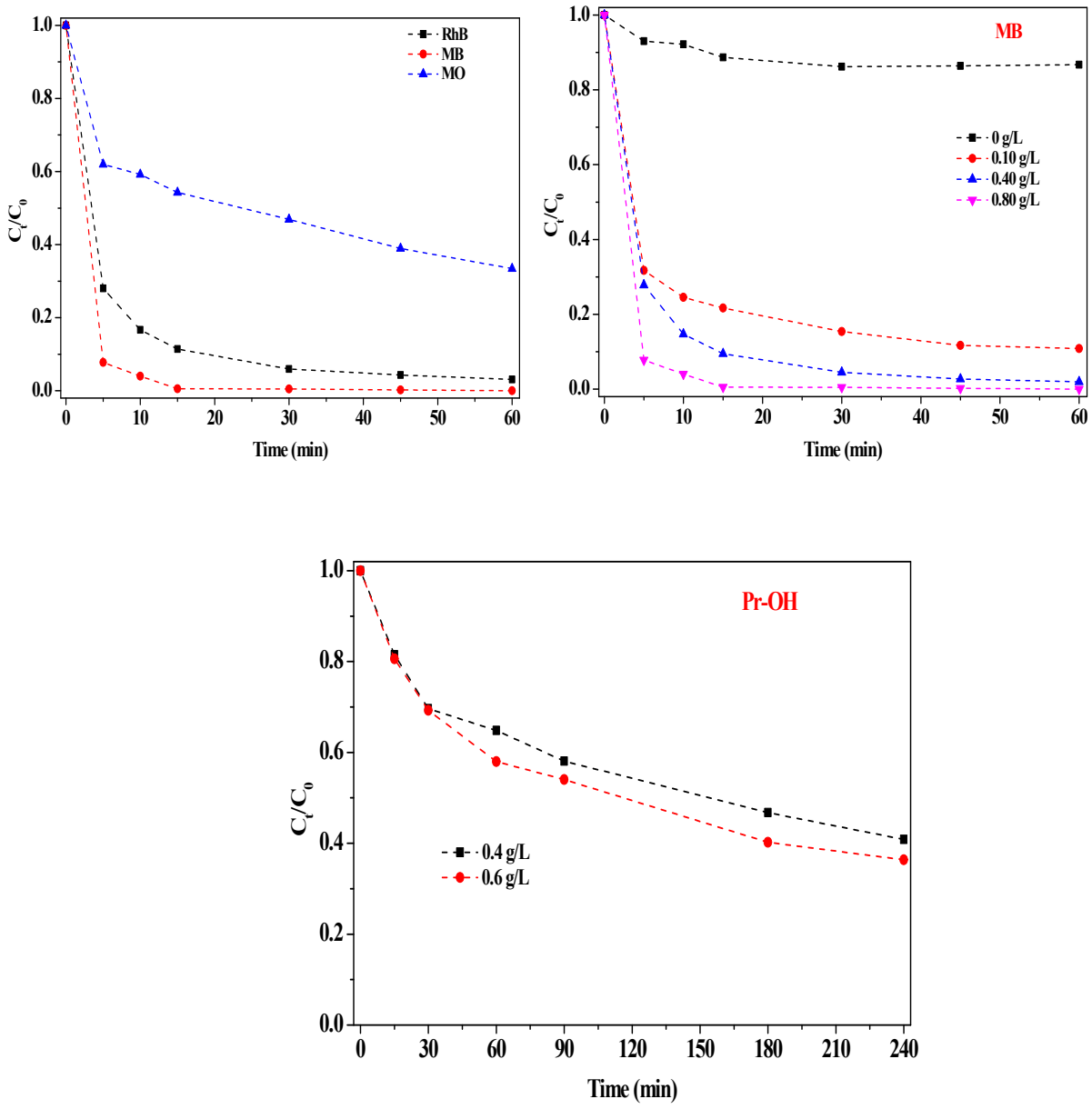


Figure S10 Effect of other organic pollutants on the degradation. Reaction conditions: [$NaHCO_3$] = 10 mM, [H_2O_2] = 15 mM, [O/g-C_3N_4] = 0.8 g L^{-1}, [Organics] = 10 mg L^{-1}, 25 °C, pH ≈ 8.4 and 60 min.

Figure S11

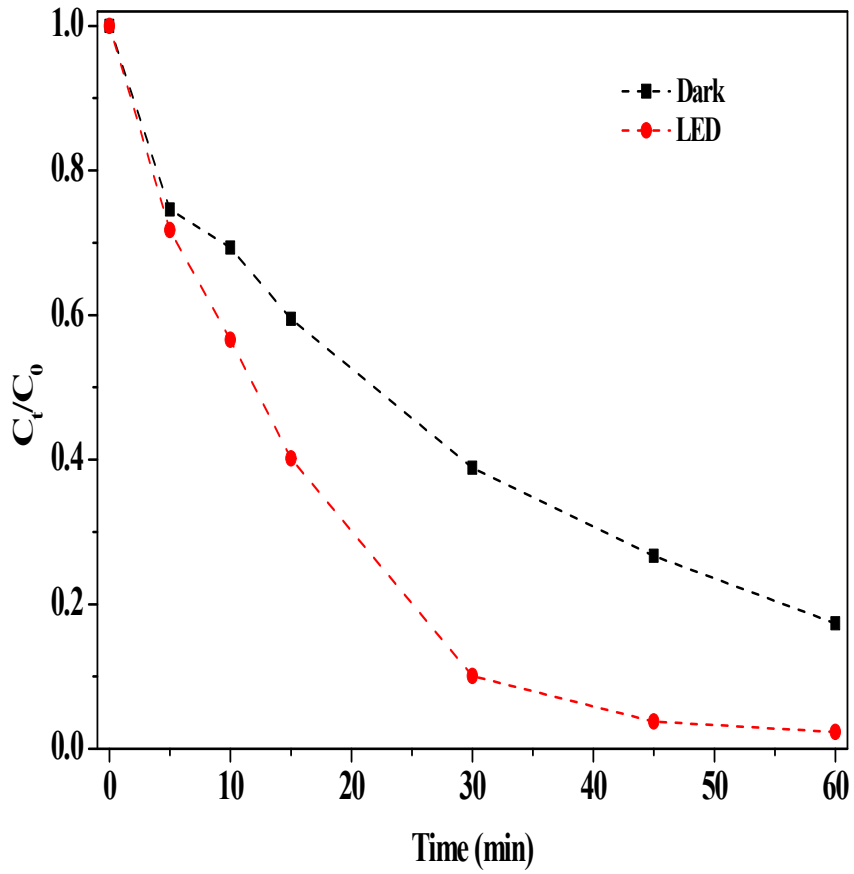


Figure S11 Comparison results of dark and LED illumination on the RhB degradation. Reaction conditions: [$NaHCO_3$] = 10 mM, [H_2O_2] = 15 mM, [O/g-C_3N_4] = 0.1 g L^{-1}, [RhB] = 10 mg L^{-1}, 25 ^oC, pH ≈ 8.4 and 60 min.

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Figure S12

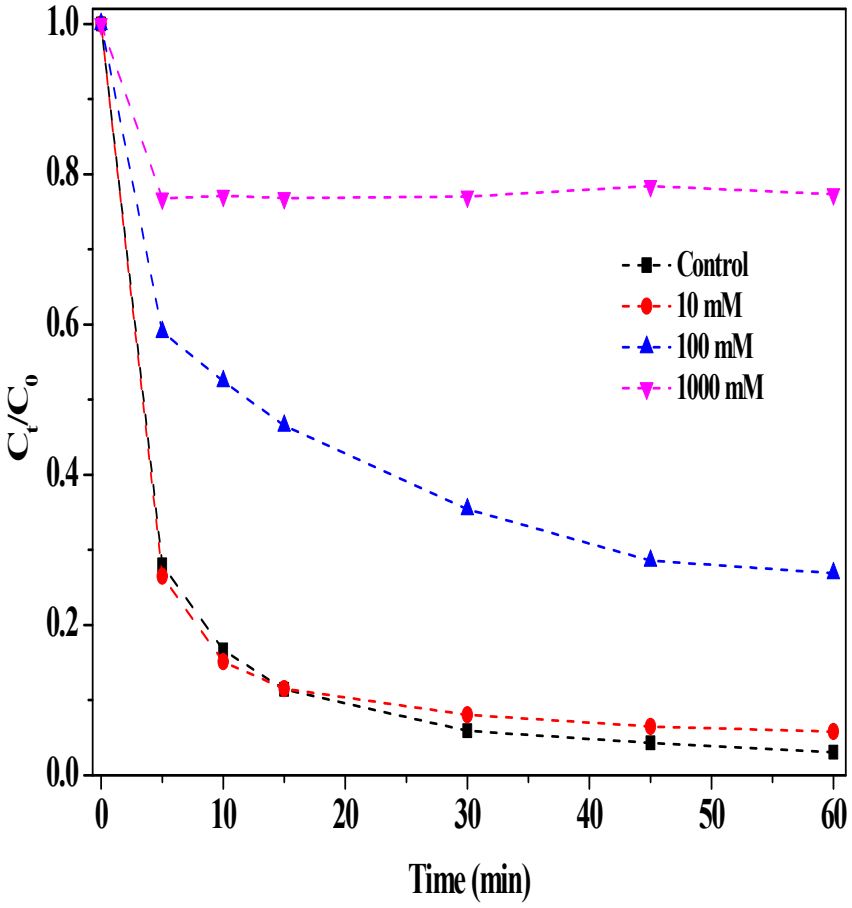

Figure S12 Effect of concentrations of ascorbic acid on the RhB degradation. Reaction conditions: [$NaHCO_3$] = 10 mM, [H_2O_2] = 15 mM, [O/g-C_3N_4] = 0.8 g L^{-1}, [RhB] = 10 mg/L, 25 ^oC, pH ≈ 8.4, 60 min, [Ascorbic acid] = 10, 100 and 1000 mM, respectively.

Figure S13

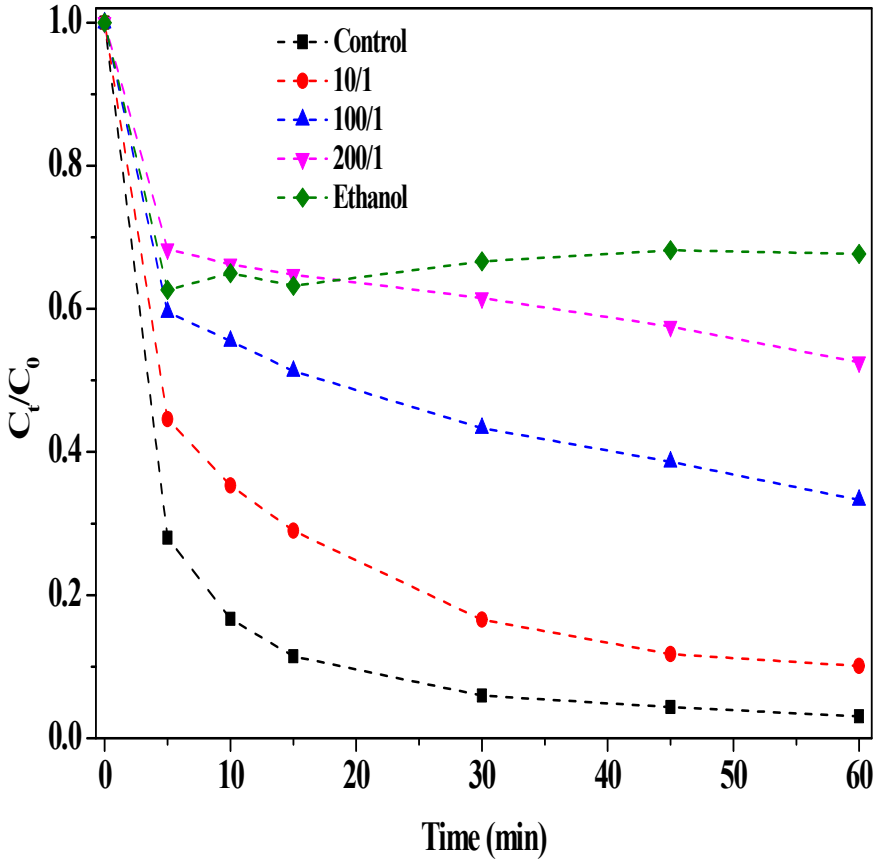

Figure S13 Effect of concentrations of ethanol on the RhB degradation. Reaction conditions: [$NaHCO_3$] = 10 mM, [H_2O_2] = 15 mM, [O/g-C_3N_4] = 0.8 g L^{-1}, [RhB] = 10 mg L^{-1}, 25 ^oC, pH ≈ 8.4, 60 min, [Ethanol] = 0.15 M, 1.5 M, 3.0 M, ethanol replacing of water, respectively.

Figure S14

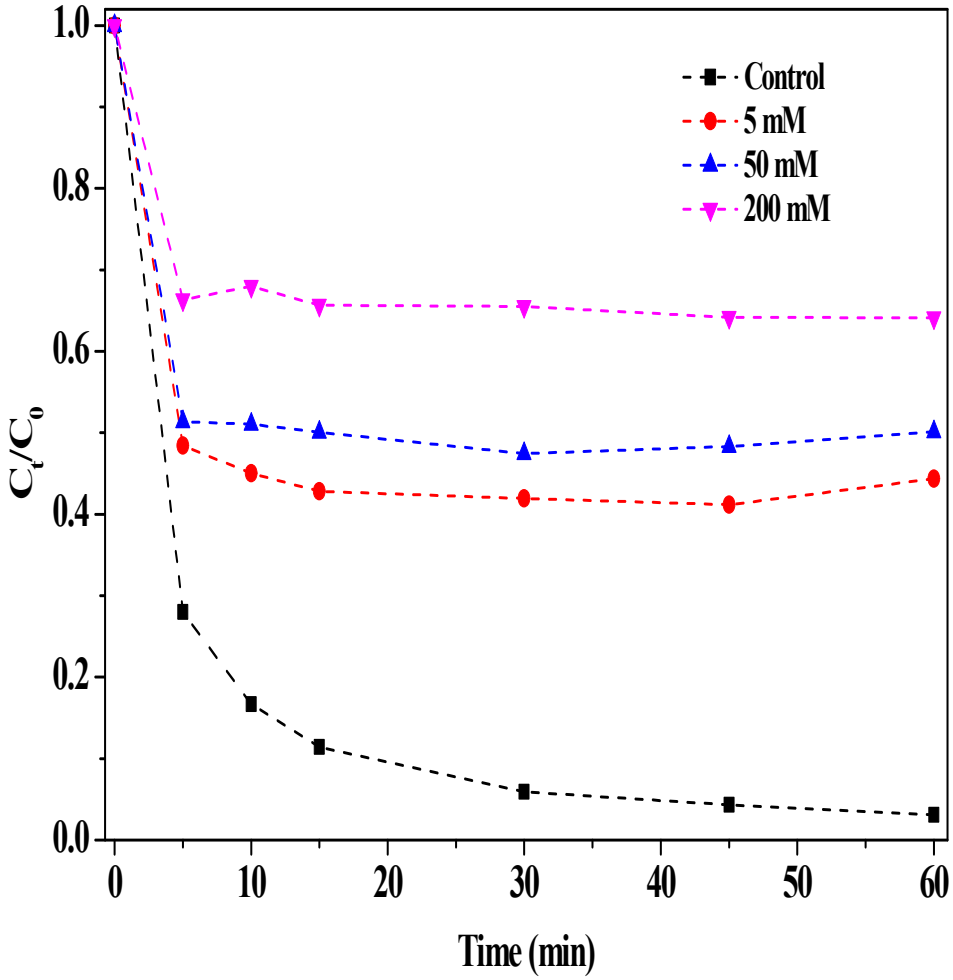

Figure S14 Effect of concentration of Tiron on the RhB degradation. Reaction conditions: [$NaHCO_3$] = 10 mM, [H_2O_2] = 15 mM, [O/g-C_3N_4] = 0.8 g L^{-1}, [RhB] = 10 mg L^{-1}, 25 ^oC, pH ≈ 8.4, 60 min, [Tiron] = 5, 50 and 200 mM, respectively.

Figure S15

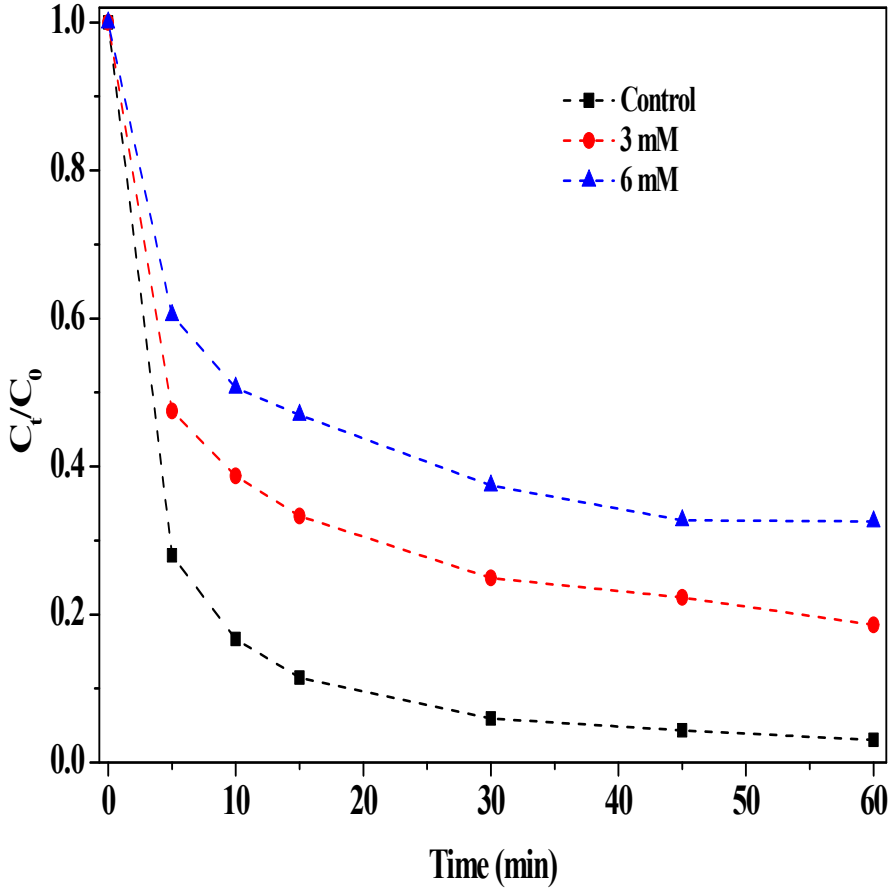

Figure S15 Effect of concentration of benzoquinone (BQ) on the RhB degradation. Reaction conditions: [$NaHCO_3$] = 10 mM, [H_2O_2] = 15 mM, [O/g-C_3N_4] = 0.8 g L^{-1}, [RhB] = 10 mg L^{-1}, 25 ^oC, pH ≈ 8.4, 60 min, [BQ] = 3 and 6 mM, respectively.

Figure S16

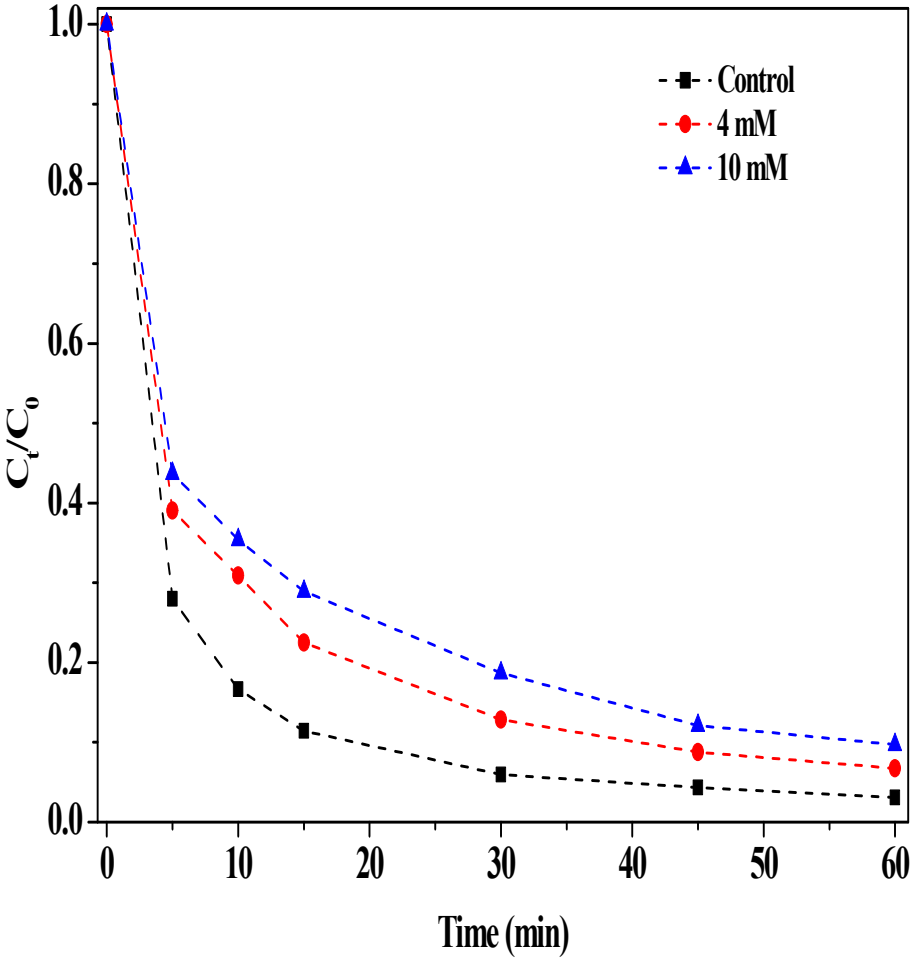

Figure S16 Effect of concentration of NaN_3 on the RhB degradation. Reaction conditions: [$NaHCO_3$] = 10 mM, [H_2O_2] = 15 mM, [O/g-C_3N_4] = 0.8 g L^{-1}, [RhB] = 10 mg L^{-1}, 25 ^oC, pH ≈ 8.4, 60 min, [NaN_3] = 4 and 10 mM, respectively.

Figure S17

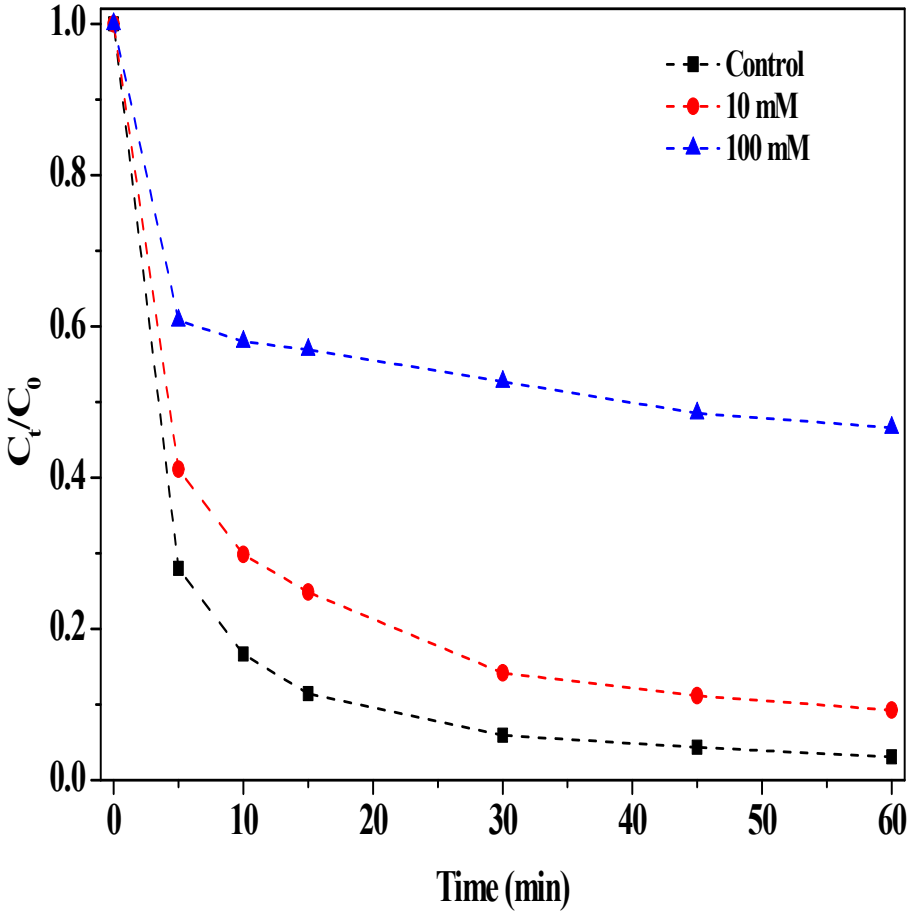

Figure S17 Effect of concentrations of furfuryl alcohol (FFA) on the RhB degradation. Reaction conditions: [$NaHCO_3$] = 10 mM, [H_2O_2] = 15 mM, [O/g-C_3N_4] = 0.8 g L^{-1}, [RhB] = 10 mg L^{-1}, 25 ^oC, pH ≈ 8.4, 60 min, [FFA] = 10 and 100 mM, respectively.

Figure S18

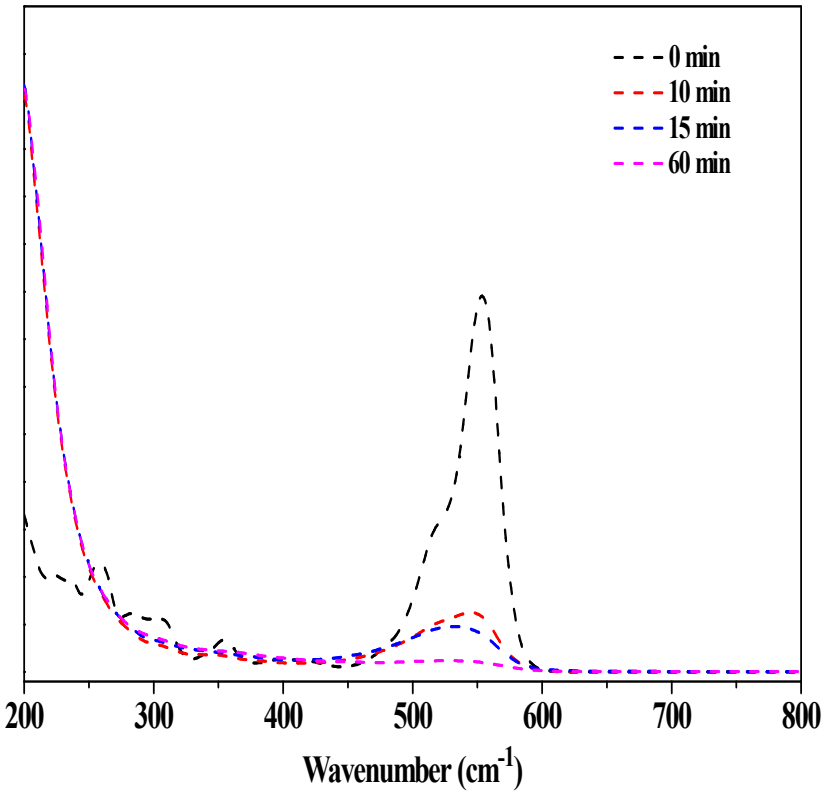

Figure S18 The degradation for RhB with the increasing time from UV-vis results.

Figure S19

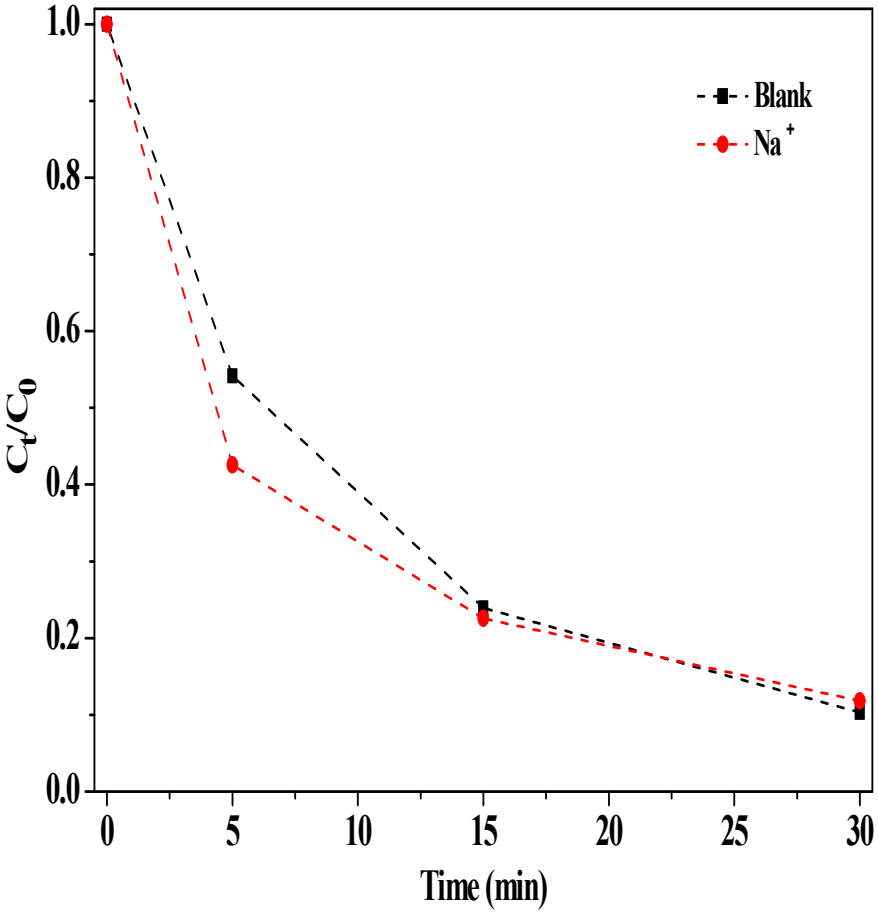

Figure S19 The effect of Na^+ over different catalysts for the RhB degradation. Reaction conditions: [$NaHCO_3$] = 10 mM, [H_2O_2] = 15 mM, [Na-O/g-C_3N_4 or O/g-C_3N_4] = 0.8 g L^{-1}, [RhB] = 10 mg L^{-1}, 25 ^oC, pH ≈ 8.4 and 30 min.

Figure S20

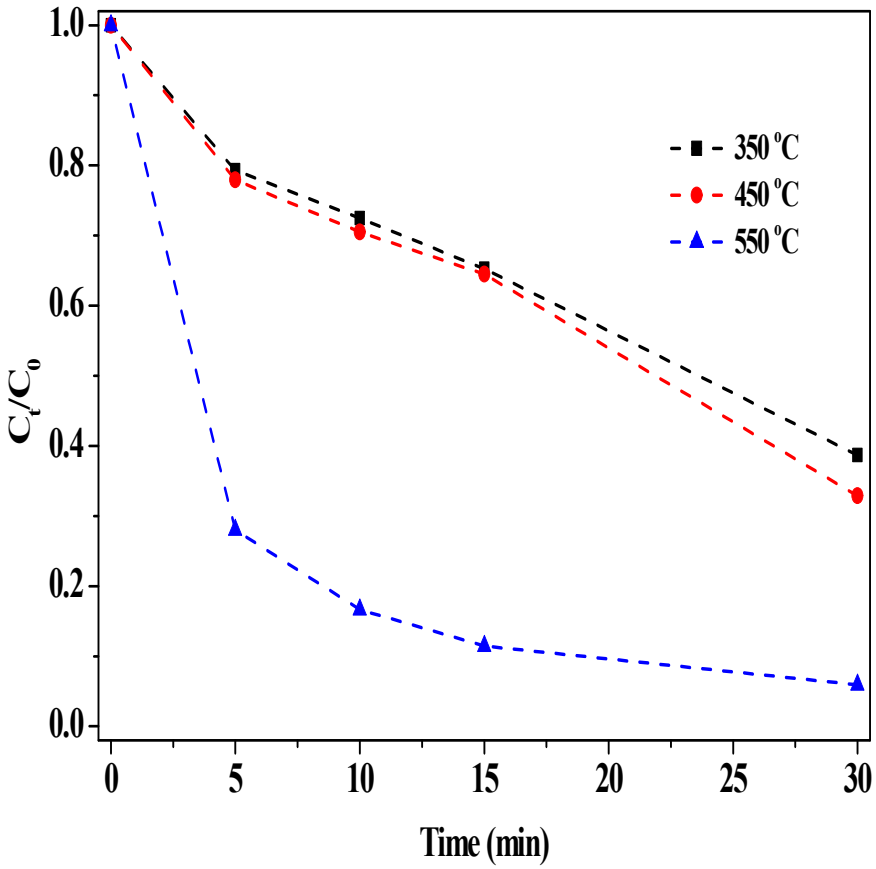

Figure S20 Effect of calcination temperature of O/g-C_3N_4 on the RhB degradation. Reaction conditions: [$NaHCO_3$] = 10 mM, [H_2O_2] = 15 mM, [O/g-C_3N_4] = 0.8 g L^{-1}, [RhB] = 10 mg L^{-1}, 25 °C, pH ≈ 8.4 and 60 min.

Table S1 Results of the content in g-C_3N_4 and O/g-C_3N_4 catalysts from element analysis.

Catalysts	C(wt%)	N(wt%)	O(wt%)	mol(C)/(N)
g-C_3N_4	36.39	62.49	1.13	0.68
O/g-C_3N_4	38.77	59.20	2.02	0.76

Table S2 The results of ratio of $N(sp^2)$ and $N(sp^3)$ and degradation of RhB in 30 min.

Catalysts	$N(sp^2)/N(sp^3)$	Degradation efficiency(%)
O/g-C_3N_4-350 ^oC	1.98	61.3
O/g-C_3N_4-450 ^oC	2.06	67.1
O/g-C_3N_4-550 ^oC	1.74	94.1