Supplementary Materials for the Manuscript

Preparation and Characterization of Sulphur and Zinc Oxide Co-Doped Graphitic Carbon Nitride for Photo-Assisted Removal of Safranin-O Dye

Azmat Ali Khan[1], Abbas Khan[1]*, Sumayya Khan[1], Nasrullah Shah[1], Ajmal Khan[2], Faheem Nawaz[3], Asaad Khalid[4], Afnan Jan[5], Ahmed Al-Harrasi*[2]

[1]Department of Chemistry, Abdul Wali Khan University, Mardan 23200, KP, Pakistan; E-mails: asaster45@gmail.com (Azmat A Khan), abbas80@awkum.edu.pk (Abbas Khan), muhammadtalhay42@gmail.com (S. K), nasrullah@awkum.edu.pk (N. S)

[2]Natural and Medical Sciences Research Center, University of Nizwa, PO Box 33, 616 Birkat Al Mauz, Nizwa, Oman; E-mails: ajmalkhan@unizwa.edu.om (Ajmal Khan) ; aharrasi@unizwa.edu.om (Ahmed Al-Harrasi)

[3]Department of Environmental Science, Faculty of Life Sciences & Informatics, Balochistan University of Information Technology, Engineering and Management Sciences (BUITEMS), Quetta, Pakistan E-mail: faheem.nawaz@buitms.edu.pk (Faheem Nawaz)

[4]Substance Abuse and Toxicology Research Center, Jazan University, P.O. Box: 114, Jazan 45142, Saudi Arabia. akahmed@jazanu.edu.sa (A.K)

[5]Department of Biochemistry, Faculty of Medicine, Umm Al-Qura University, Makkah, Kingdom of Saudi Arabia. E-mail: Amjan@uqu.edu.sa (A. J)

Corresponding Authors:

Professor Dr. Abbas Khan

Department of Chemistry, Abdul Wali Khan University Mardan, 23200, Pakistan. Telephone: +92-3408467885, Fax: +92-937-542188, E-mail: abbas80@awkum.edu.pk; abbas053@gmail.com

Professor Dr. Ahmed Al-Harrasi

Natural and Medical Sciences Research Center, University of Nizwa, PO Box 33, 616 Birkat Al Mauz, Nizwa, Oman. E-mail: aharrasi@unizwa.edu.om

Table S1. Average crystalline size of the prepared nanomaterials.

S.NO.	Samples ID	Crystallite size (D_p), (nm)
1	g-C_3N_4	08.09
2	ZnO	09.07
3	S-g-C_3N_4	10.98
4	ZnO-S-g-C_3N_4	11.13

Table S2. The elemental composition of g-C_3N_4, S-g-C_3N_4, and ZnO-S-g-C_3N_4 from EDX.

Sample	Element	Mass%	Atomic%
g-C_3N_4	CK	81.26	83.49
	NK	18.78	16.51
	Total	100.00	100.00
S-g-C_3N_4	CK	75.82	78.53
	NK	23.18	20.47
	SK	1.00	1.00
	Total	100.00	100.00
ZnO-S-g-C_3N_4	CK	55.82	60.29
	NK	12.18	16.21
	OK	1.00	1.12
	KK	1.38	0.36
	Zn	1.01	1.02
	S	1.00	1.00
	Total	100.00	100.00

Table S3. First-order rate constant, regression values and percentage removal efficiencies of prepared catalysts toward the photocatalytic degradation of Safranin-O.

S.NO	Catalyst	Dye	Conditions	Time of Experiment (Minutes)	removal (%)	R^2 Value for 1st Order Plot	1st Order Rate Constant, k (min^{-1})	References
1	g-C_3N_4	SO	UV-Light	360	69.00	0.94660	0.00249	Present Work
2	g-C_3N_4	SO	Dark	480	20.00	0.97152	0.00041	Present Work
3	S-g-C_3N_4	SO	UV-Light	270	88.54	0.90922	0.00690	Present Work
4	S-g-C_3N_4	SO	Dark	480	36.22	0.84046	0.00066	Present Work
5	ZnO-S-g-C_3N_4	SO	UV-Light	150	87.00	0.89186	0.00989	Present Work
6	ZnO-S-g-C_3N_4	SO	Dark	480	58.64	0.75568	0.00144	Present Work
7	SiO_2-TiO_2	SO	UV-Light	12	93	0.9983	-	[61]
8	PUCP1@rGO	SO	Visible light	90	76	-	-	[62]
9	WO_3	SO	UV irradiation	10	94	0.9649	0.2566	[63]
10	TiO_2	SO	UV light	70	60	0.996	0.025	[64]
11	Ag–TiO_2	SO	UV light	70	96	0.987	0.035	[64]
12	ZnO–CeO_2-$Yb2O_3$	SO	Sunlight irradiation	40	68	-	0.0264	[65]
13	HNTs	SO	-	360	98	0.867	0.00679	[66]
14	Ag/Pd	SO	UV-light	40	98	0.98783	0.00571	[67]
15	Ag-NPs	SO	Light	120	70	0.99	-	[68]

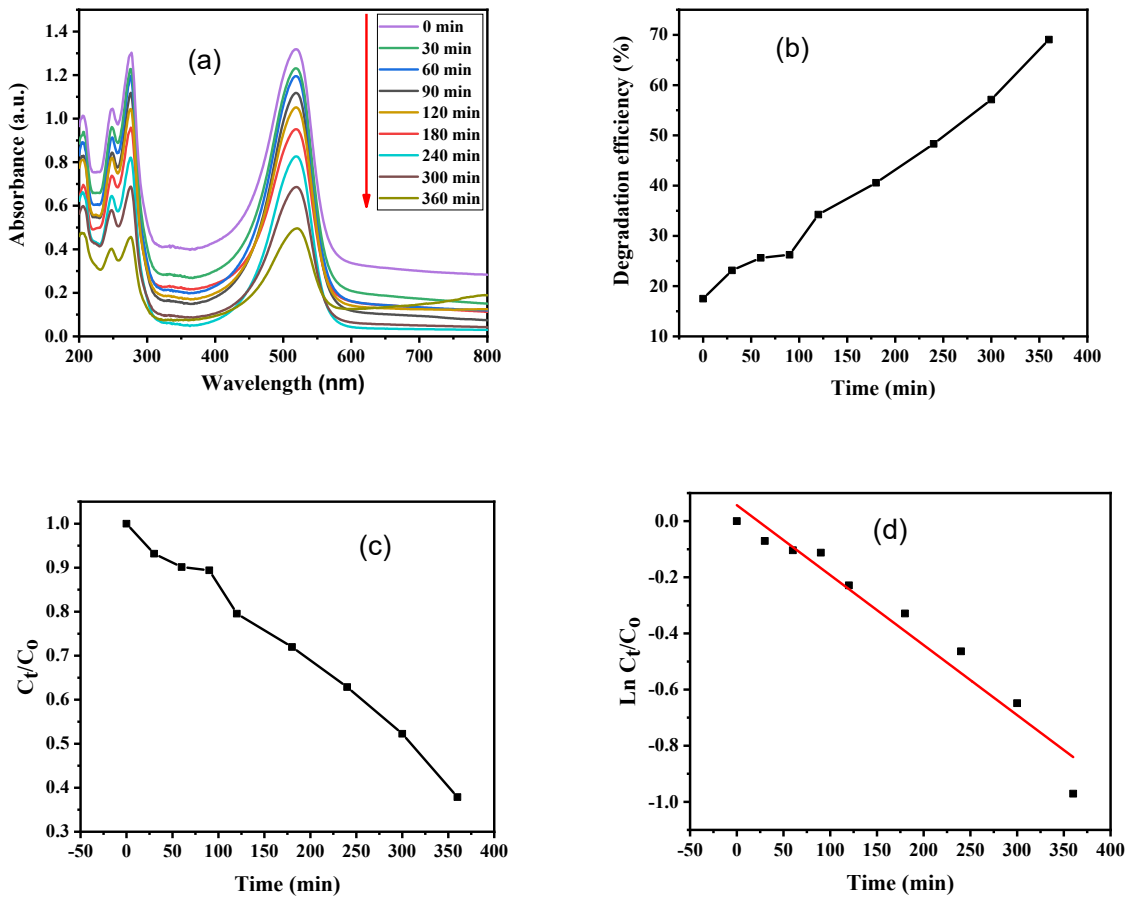
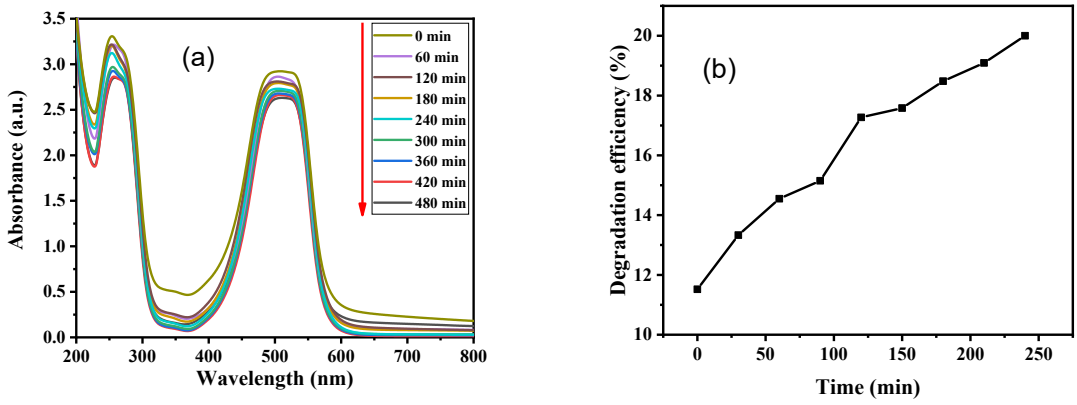


Figure S1. SO degradation with the aid of 0.1g g-C_3N_4 in the presence of light; (a) Change in UV-Visible absorbance spectra at different time intervals, (b) degradation efficiency, (c) absorbance ratio (Ct/C_0) versus time, (d) plot of pseudo-first-order kinetics of degradation.



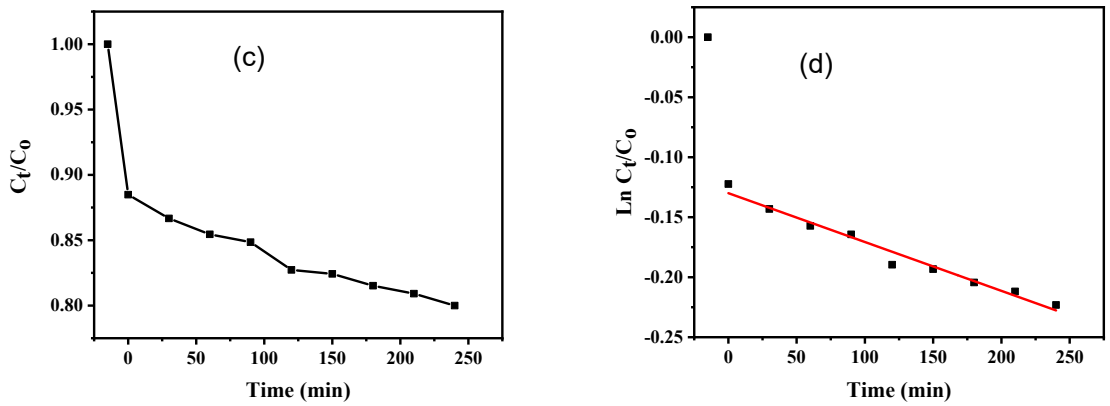
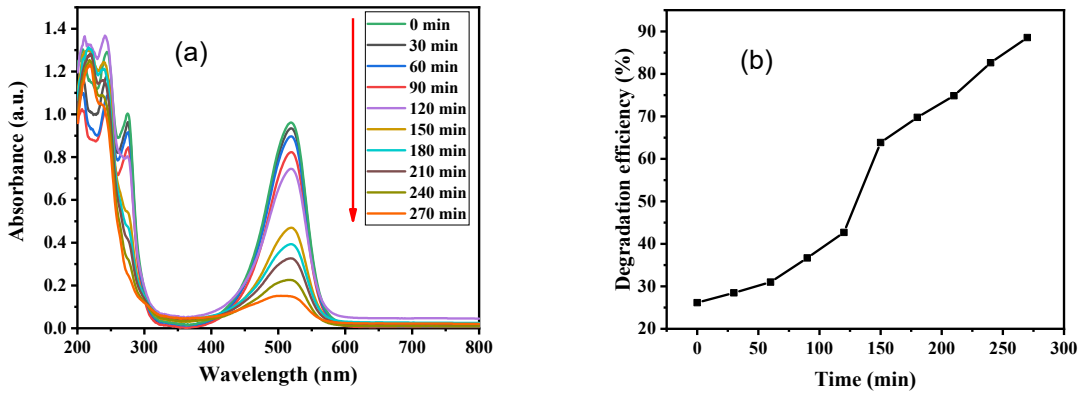


Figure S2. SO degradation with the aid of 0.1g g-C_3N_4 in the absence of light (dark condition); (a) Change in UV-Visible absorbance spectra at different time intervals, (b) degradation efficiency, (c) absorbance ratio (Ct/C_0) versus time, (d) plot of pseudo-first-order kinetics of degradation.



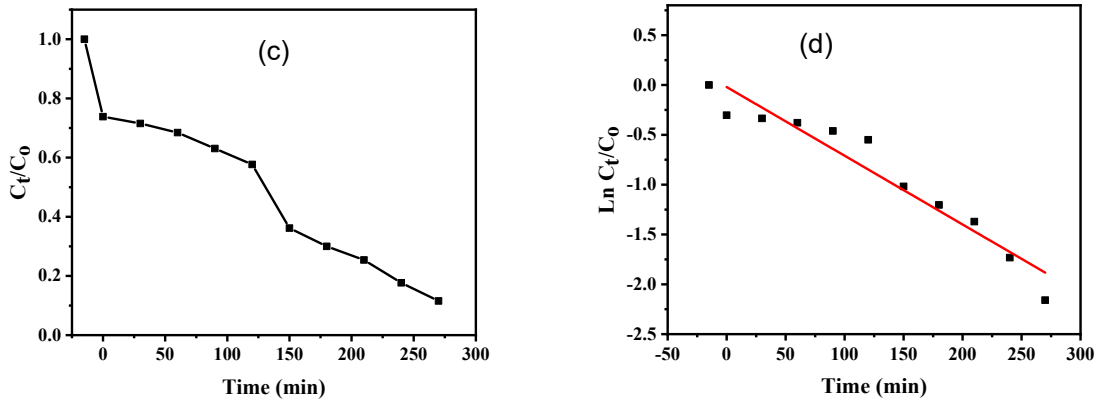
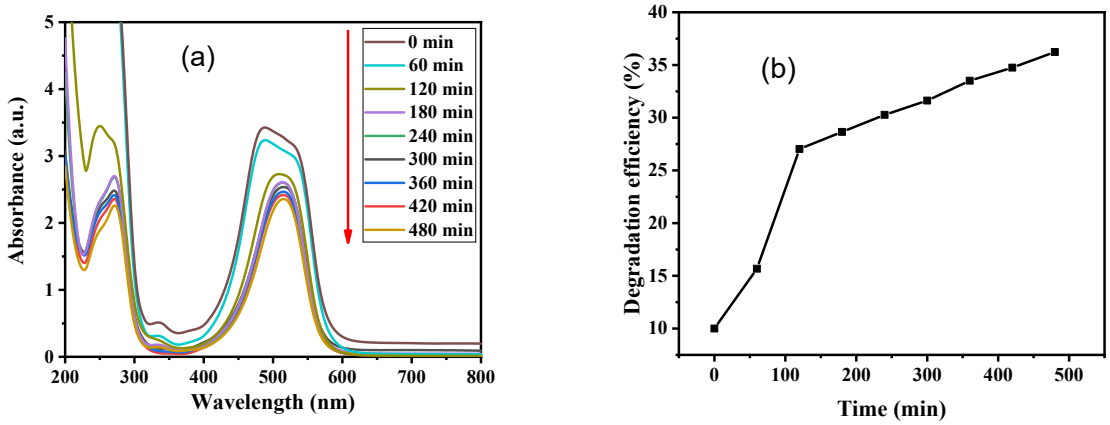


Figure S3. SO degradation with the aid of 0.1g S-g-C_3N_4 in the presence of light; (a) Change in UV-Visible absorbance spectra at different time intervals, (b) degradation efficiency, (c) absorbance ratio (C_t/C_0) versus time, (d) plot of pseudo-first-order kinetics of degradation.



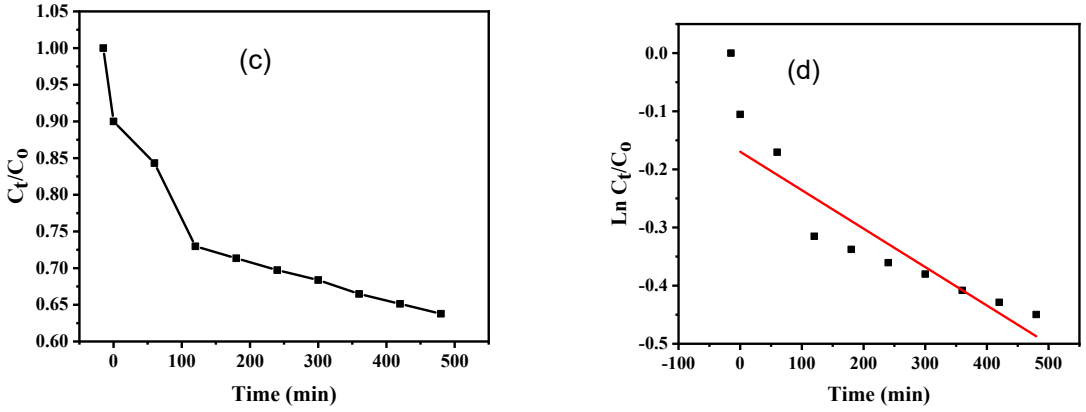


Figure S4. SO degradation with the aid of 0.1g S-g-C_3N_4 in the absence of light (dark condition); (a) Change in UV-Visible absorbance spectra at different time intervals, (b) degradation efficiency, (c) absorbance ratio (C_t/C_0) versus time, (d) plot of pseudo first-order kinetics of degradation.