

**Mechanistic Elucidation and Real Water Application of a Band-Engineered
CoMgAl-LTH/CdS S-Scheme Heterojunction as an Efficient Advanced
Oxidation Process-Based Catalyst for Textile Dyes Degradation and
Environmental Safety Evaluation**

R. Janani, Anitha Pius*

Department of Chemistry, The Gandhigram Rural Institute - Deemed to be University

Gandhigram, Dindigul – 624 302. Tamilnadu, India.

**Corresponding author: dranithapius@gmail.com*

Fig. S1. Simulated XRD pattern.

Table. S1. Physicochemical parameters for real water samples.

Table. S2. Comparison of the prepared photocatalyst with previously reported materials.

Table. S3a. Toxicity estimation of AO and its intermediates.

Table. S3b. Toxicity estimation of BB and its intermediates.

Fig. S1. Simulated XRD pattern.

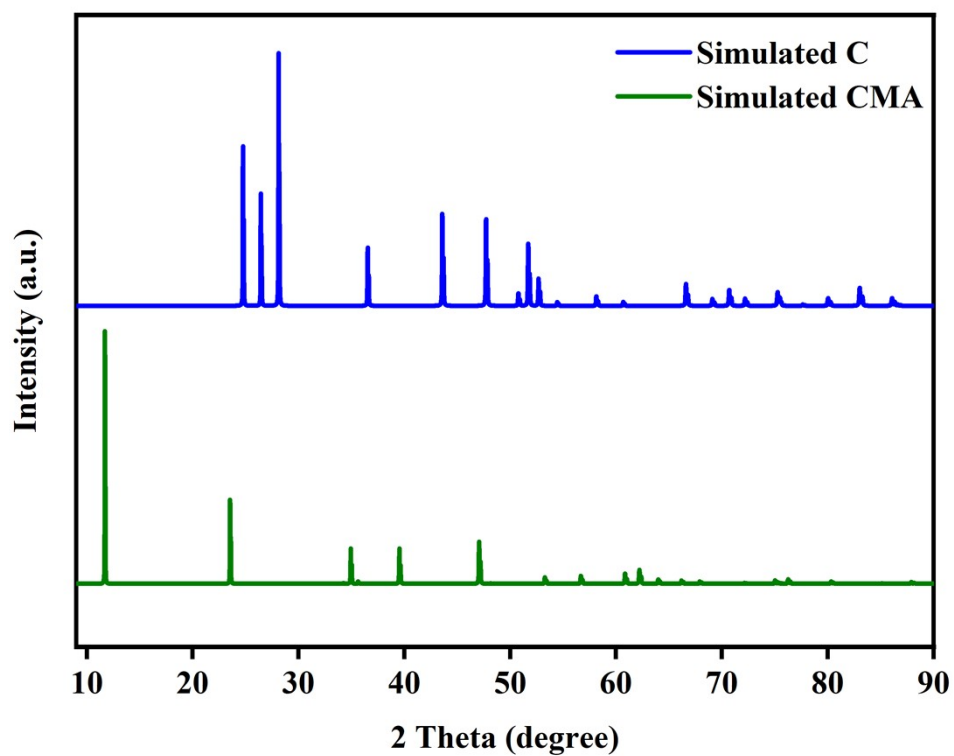


Table. S1. Physicochemical parameters for real water samples.

S. No	Water source	pH	EC (μScm^{-1})	TDS (mgL^{-1})	Salinity (ppt)
1.	Lake water (Kodaikanal)	7.3	440	270	0.3
2.	Sea water (Kanyakumari)	8.6	51,400	32,800	35
3.	Tap water	7.1	610	390	0.4

Table. S2. Comparison of the prepared photocatalyst with previously reported materials.

S. No	Photocatalyst	Pollutant	Catalyst Dosage (mg)	Antibiotic Concentration (mg/L)	Time (min)	Degradation Efficiency (%)	Light source	Reference
1.	sodium polytungstate polyoxometalate	AO	40	15	110	71.75	LED	¹
2.	Carbon-CaO	AO	5	20	120	88.38	UV	²
3.	Zn:ZnO/Ni ₂ P	AO	14	13.13	61	95.47	Visible light	³
4.	SiO ₂ /g-C ₃ N ₄	AO	10	10	120	70	Visible light	⁴
5.	CoMgAl-LTH/CdS	AO	15	20	30	99.5	Visible light	This work
6.	Ti-doped Bi ₂ O ₃	BB	1000	20	180	93.27	Visible light	⁵
7.	EG NiO catalyst	BB	1250	10	90	90.0	Visible light	⁶
8.	WO ₃ -ZnO	BB	200	15	40	90%	Solar light	⁷
9	CoMgAl-LTH/CdS	BB	15	20	60	98	Visible light	This work

Table. S3a. Toxicity estimation of AO and its intermediates.

S. No	m/z values	LC50 (mg/L)	LD50 (mg/L)	Mutagenicity
1.	308.83	6.48	97.9	Positive
2.	267.17	12.11	271.4	Positive
3.	268.16	10.12	118.9	Positive
4.	165.08	14.13	374.12	Negative
5.	148.10	13.51	574.63	Negative
6.	138.07	22.97	839.1	Negative
7.	121.10	29.11	779.83	Negative
8.	110.04	39.51	921.68	Negative
9.	108.08	57.36	1408.06	Negative

Table. S3b. Toxicity estimation of BB and its intermediates.

S. No	m/z values	LC50 (mg/L)	LD50 (mg/L)	Mutagenicity
1.	802.26	0.33	89.8	Positive
2.	818.25	0.44	91.5	Negative
3.	450.61	0.56	356.9	Negative
4.	330.43	0.78	418.4	Negative
5.	329.20	0.75	657	Negative
6.	216.21	0.88	725	Negative
7.	180.06	0.84	845	Negative
8.	138.09	0.86	1373	Negative

References

- (1) Mousavi, S. M.; Hashemi, S. A.; Bahrani, S.; Mosleh, S.; Chiang, W. H.; Yousefi, K.; Ramakrishna, S.; Wei, L. C.; Omidifar, N. Hybrid of Sodium Polytungstate Polyoxometalate Supported by the Green Substrate for Photocatalytic Degradation of Auramine-O Dye. *Environ. Sci. Pollut. Res.* 2022, 29 (37), 56055–56067.
- (2) Vatchalan, L.; Kesavan, B.; Selvam, P. Adsorption and Photocatalytic Degradation of Auramine–O Dye Using Carbon Nanoparticles and Carbon–CaO Nanocomposites. *Nanotechnol. Environ. Eng.* 2023, 8 (1), 109–117.
- (3) Barzegar, M. H.; Ghaedi, M.; Madadi Avargani, V.; Sabzehmeidani, M. M.; Sadeghfard, F.; Jannesar, R. Electrochemical Synthesis of Zn:ZnO/Ni₂P and Efficient Photocatalytic Degradation of Auramine O in Aqueous Solution under Multi-Variable Experimental Design Optimization. *Polyhedron* 2019, 165, 1–8.
- (4) Shoran, S.; Sharma, A.; Chaudhary, S. Visible Light Enhanced Photocatalytic Degradation of Organic Pollutants with SiO₂/g-C₃N₄ Nanocomposite for Environmental Applications. *Environ. Sci. Pollut. Res.* 2023, 30 (44), 98732–98746.
- (5) Gan, C.; Tuo, B.; Wang, J.; Tang, Y.; Nie, G.; Deng, Z. Photocatalytic Degradation of Reactive Brilliant Blue KN-R by Ti-Doped Bi₂O₃. *Environmental Science and Pollution Research*. 2023, pp 34338–34349.
- (6) Hanafi, M. F.; Sapawe, N. Effect of PH on the Photocatalytic Degradation of Remazol Brilliant Blue Dye Using Zirconia Catalyst. *Mater. Today Proc.* 2020, 31, 260–262.
- (7) Hunge, Y. M.; Yadav, A. A.; Mathe, V. L. Ultrasound Assisted Synthesis of WO₃-ZnO Nanocomposites for Brilliant Blue Dye Degradation. *Ultrason. Sonochem.* **2018**, 45 (January), 116–122.