Supplementary Information (SI) for New Journal of Chemistry.

Supplementary Information

ZnO_2-SnO_2: A new, efficient heterojunction composite for the rapid and enhanced photocatalytic degradation of Rhodamine B dye and Moxifloxacin antibiotic under UV irradiation and Sunlight

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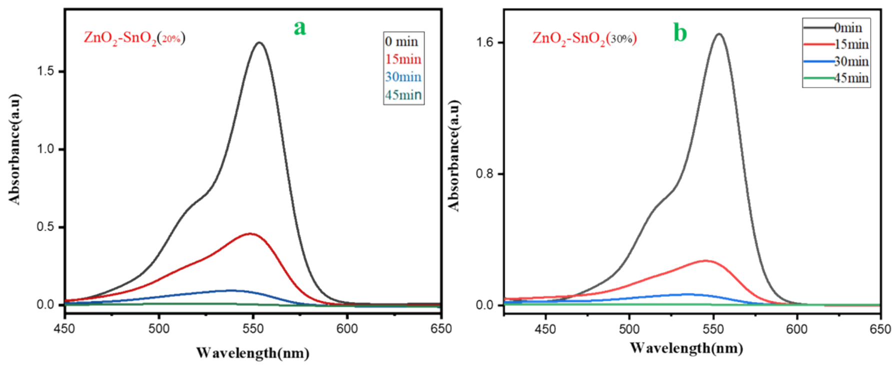


Fig. S1 (a, b) Photocatalytic Degradation of Rh B by ZnO_2-SnO_2 under UV irradiation

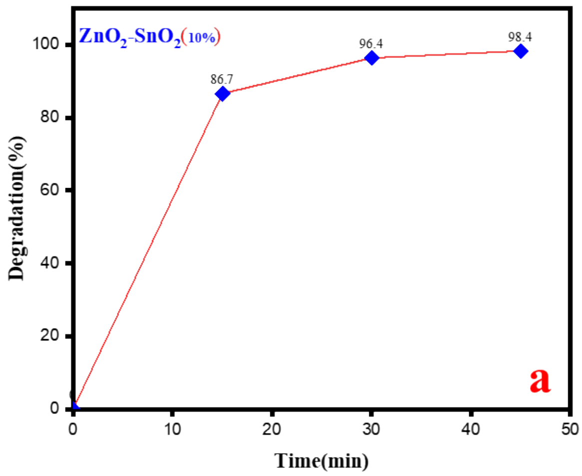


Fig. S2 (a) Degradation percentages of Rh B by ZnO_2-SnO_2 under UV irradiation

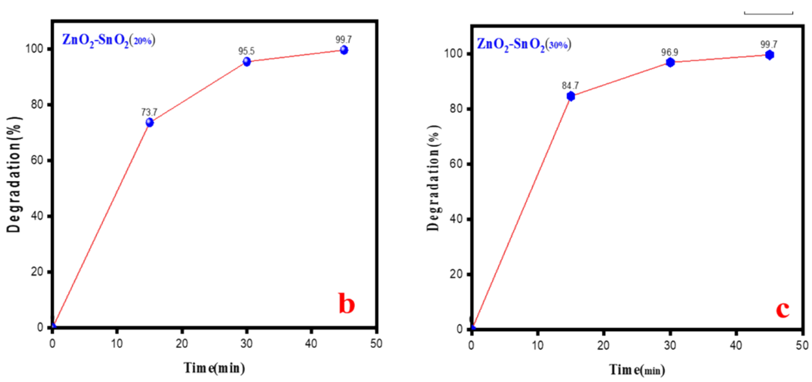


Fig. S3 (b, c) Degradation percentages of Rh B by ZnO_2-SnO_2 under UV irradiation

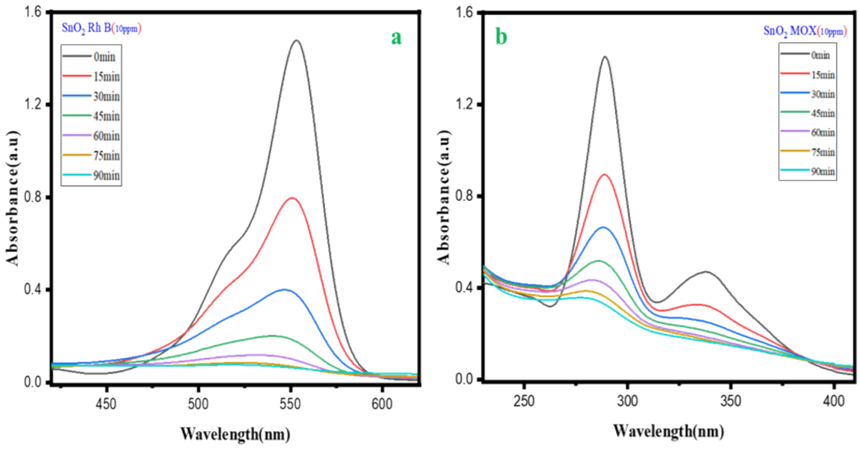


Fig. S4 Photocatalytic Degradation of (a) Rh B and (b) MOX by SnO_2 under UV irradiation

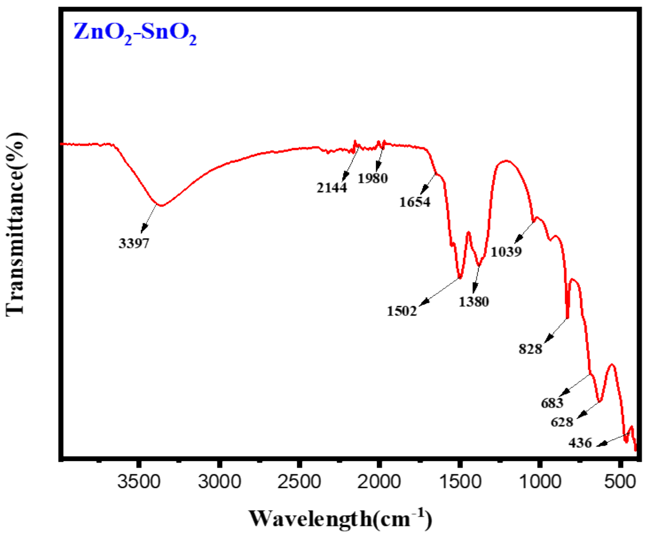


Fig. S5 FTIR pattern of the composite material

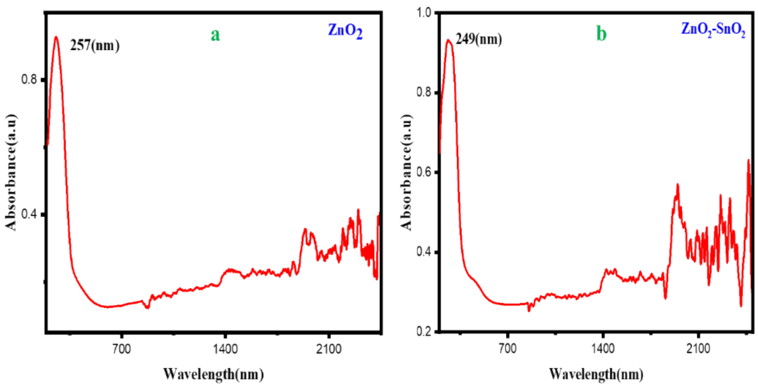


Fig. S6 UV-DRS reflectance spectra; (a) ZnO_2, (b) ZnO_2-SnO_2

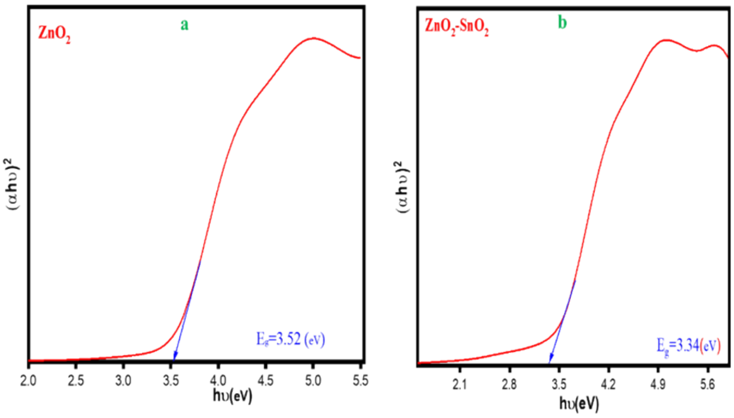


Fig. S7 Tauc's plot; (A) ZnO_2, (B) ZnO_2-SnO_2

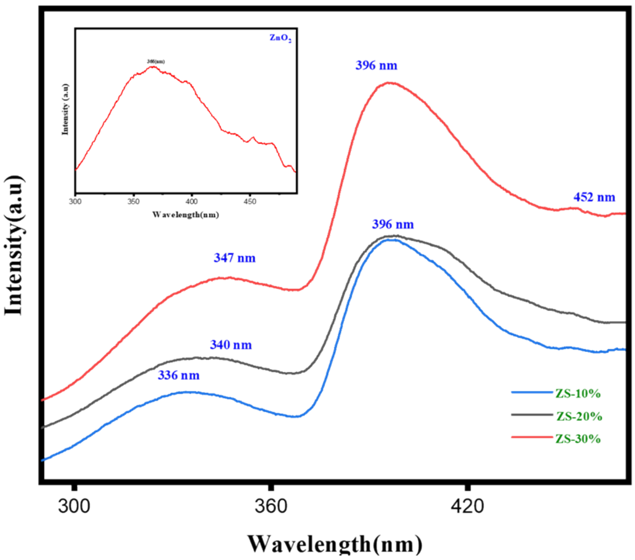


Fig. S8 Photoluminescence Spectra

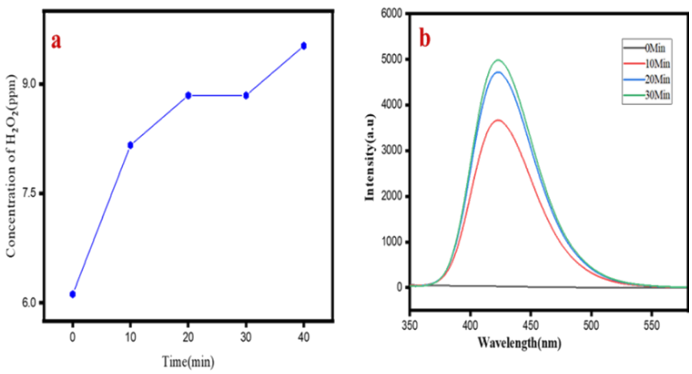


Fig. S9 (a) Estimation of H_2O_2, (b) Fluorescence Spectroscopy of hydroxyl TA from aqueous suspension of ZnO_2-SnO_2

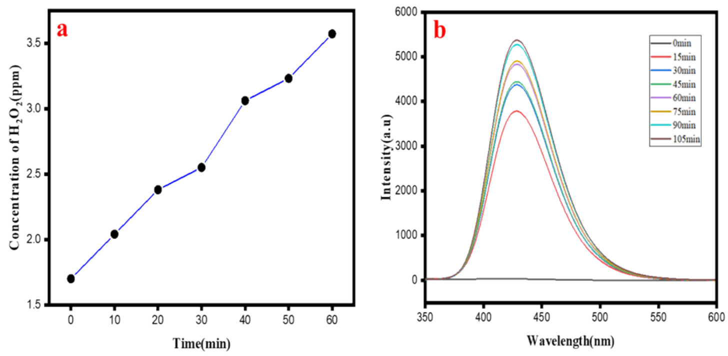


Fig. S10 (a) Estimation of H_2O_2 and (b) Fluorescence Spectroscopy of hydroxyl TA from aqueous solution of ZnO_2

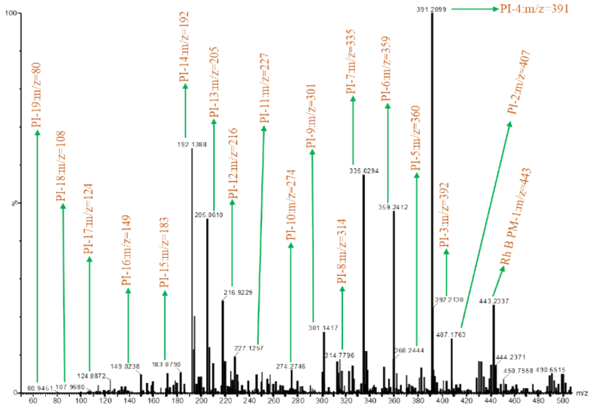


Fig. S11 HR-MS spectra of different photo-intermediates for the Rh B dye degradation

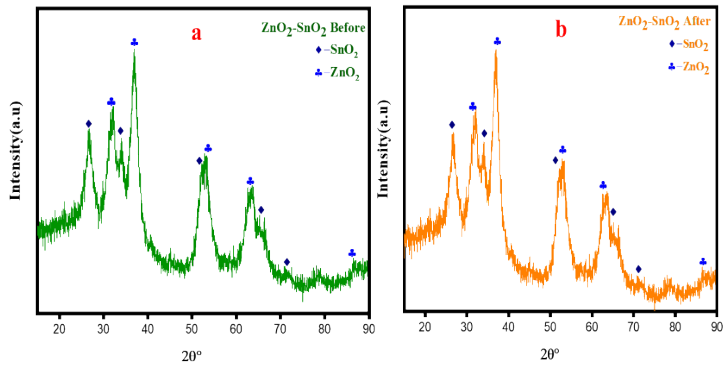


Fig. S12 XRD patterns of the photocatalyst (a) before and (b) after treatment

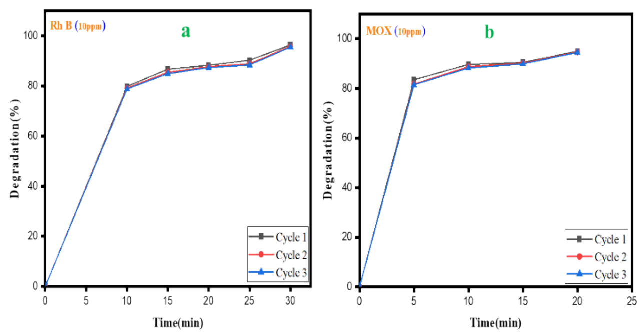


Fig. S13 Recyclability tests (a) Rhodamine B (b) Moxifloxacin

Table S1 Comparison of the structural characteristics of ZnO_2-SnO_2 composite with that of the similar composites

S. No.	Catalyst	Morphology	Surface Area (m^2/g)	Pore Volume (cm^3/g)	Reference
1	**TiO_2/WO3**	Single-layered nanotubes are formed with the wall thickness of about 50 nm	31.8	-	[1]
2	**ZnO-SnO_2**	Nanocomposite were calcinated at different temperatures and are composed of uniform spherical with size of 50 nm	37.5	-	[2]
3	**SnO_2-ZnO**	The prepared material looks like flake-like micro-size planes and upon observation different structures were formed	21.5	0.15	[3]
4	**ZnO_2/ZnO**	Nanorod-like structures were formed with the average diameter of 60nm	21.9	0.07	[4]
5	**ZnO_2-SnO2**	Nanocomposites are nearly spherical in shape with an average size of less than 20 nm and are nearly uniform with some voids formed on-to patterns of catalyst	95.6	0.14	This Work

Table S2 Comparison of literature report of the photocatalytic activity of various photocatalysts for degradation of organic pollutant (Rhodamine B dye)

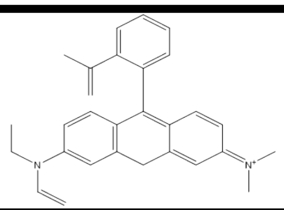
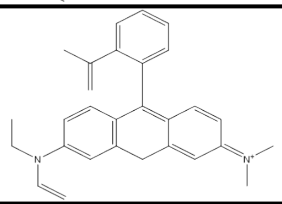
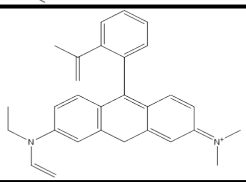
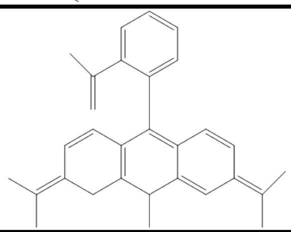
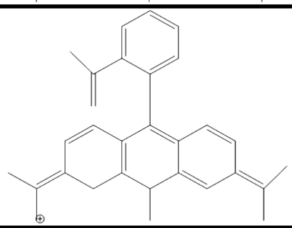
Photocatalyst	Catalyst Amount (mg)	Dye Concentration	Degradation %	Degradation Time (Minutes)	Kinetics (x 10^{-2} min^{-1})	Ref.
In_2O_3-SnO_2	50	10 mg/L	97	240	1.35	[5]
SnO_2-TiO_2	100	10^{-5}mol/L	92	180	1.22	[6]
ZnO-SnO_2	100	05 mg/L	99	240	1.66	[7]
TiO_2- SnO_2	40	10 mg/L	38	270	-	[8]
ZnO_2-SnO_2	50	10 mg/L	96	30	10.02	This Work

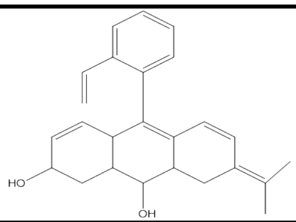
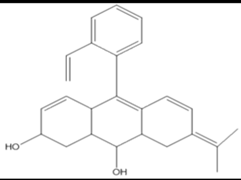
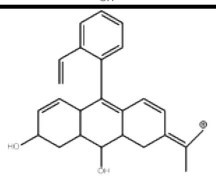
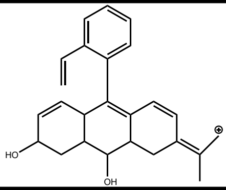
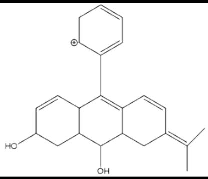
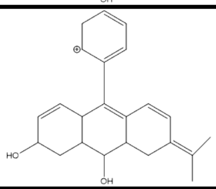
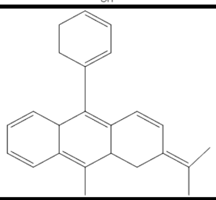
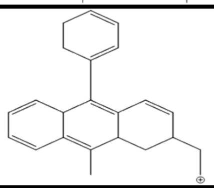
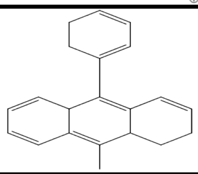
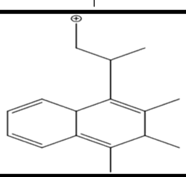
Table S3 Comparison of literature report of the photocatalytic activity of various photocatalysts for degradation of organic pollutant (Moxifloxacin antibiotic)

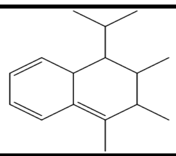
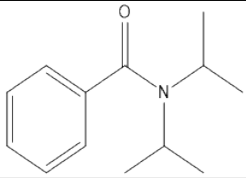
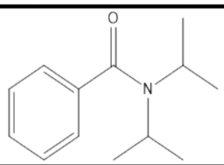
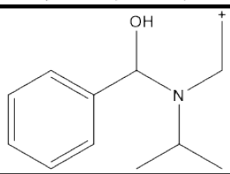
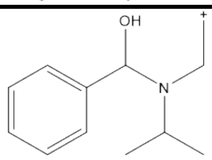
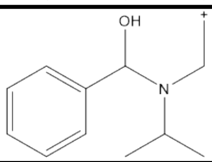
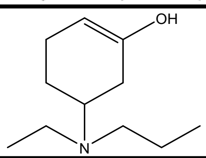
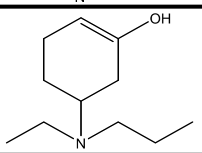
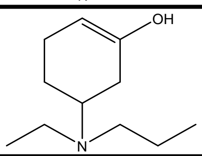
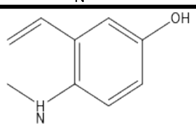
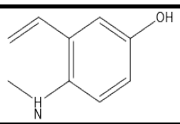
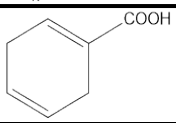
Photocatalyst	Catalyst Amount	Concentration (ppm)	Degradation %	Degradation Time (Minutes)	Kinetics (x 10^{-2} min^{-1})	Ref.

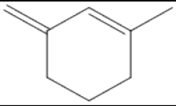
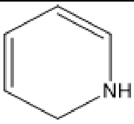
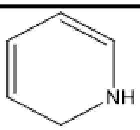
BiOCl/Cu_2O	50 mg	20	80	210	0.65	[9]
NiFe-LDH/rGO	1g/L	20	90.4	60	1.36	[10]
Au/CuS/ CdS/TiO_2	0.89 g	05	75.4	60	-	[11]
ZnO_2-SnO_2	50 mg	10	95.1	20	15.5	This Work

Table S4 ECOSAR Software corresponds for photodegradation intermediates to its acute and chronic toxicity of Rh B dye towards three different aquatic organisms

PI	Compound Structure	ECOSAR Classification	Acute toxicity (mg/L)			Chronic toxicity (mg/L)		
			Fish (LC50)	Daphnid (LC50)	Green Algae (EC50)	Fish	Daphnid	Green Algae
PM-1		Vinal/ allyl/ propargyl ethers	1090	3550	2720	73.2	353	1640
PI-1		Neutral Organics	1030	5600	3440	957	480	813
PI-2		Neutral Organics	51.8	31.9	33.6	5.58	3.93	10.6
PI-3		Neutral Organics	0.60	0.84	0.000026	0.17	0.000002	0.000049
PI-4		Neutral Organics	0.60	0.84	0.000026	0.17	0.000002	0.000049

PI-5		Neutral Organics	0.066	0.054	0.191	0.010	0.015	0.116
PI-5		Vinal/ allyl/ propargyl ethers	0.450	0.736	0.010	0.0042	0.0060	0.051
PI-6		Neutral Organics	0.066	0.054	0.190	0.010	0.015	0.116
PI-6		Vinal/ allyl/ propargyl ethers	0.450	0.736	0.010	0.004	0.006	0.051
PI-7		Neutral Organics	0.084	0.068	0.227	0.013	0.018	0.133
PI-7		Vinal/ allyl/ propargyl ethers	0.464	0.772	0.011	0.005	0.007	0.055
PI-8		Neutral Organics	0.00019	0.00020	0.0020	0.000039	0.000011	0.0022
PI-9		Neutral Organics	0.00047	0.00048	0.0041	0.000092	0.00024	0.0040
PI-10		Neutral Organics	0.003	0.003	0.016	0.001	0.001	0.013
PI-11		Neutral Organics	0.007	0.006	0.031	0.001	0.002	0.022

PI-12		Neutral Organics	0.020	0.017	0.069	0.003	0.005	0.044
PI-13		Neutral Organics	54.6	32.6	29.9	5.66	3.66	8.76
PI-13		Amides	21.5	19.3	3.19	0.357	3.90	2.59
PI-14		Aliphatic Amines	67.2	7.65	6.91	4.50	0.601	2.22
PI-14		Neutral Organics	357	196	125	33.5	17.2	30.2
PI-14		Benzyl Alcohol	130	101	37.5	10.6	15.1	17.1
PI-15		Aliphatic Amines	12.6	1.62	1.14	0.575	0.144	0.402
PI-15		Neutral Organics	36.8	22.3	21.5	3.88	2.59	6.48
PI-15		Vinal/ allyl/ propargyl ethers	2.21	5.35	0.132	0.353	0.205	0.855
PI-16		Neutral Organics	231	127	84.4	21.8	11.5	20.8
PI-16		Phenols	33	12.5	41.2	3.17	1.29	5.57
PI-17		Neutral Organics	908	518	394	89.3	51.3	104

PI-18		Neutral Organics	1.68	1.14	1.77	0.202	0.182	0.686
PI-19		Aliphatic Amines	102	10.5	11.5	9.22	0.751	3.46
PI-19		Neutral Organics	869	440	204	74.2	31.2	41.4

Very Toxic: LC50/EC50/ChV ≤ 1. Toxic: 10 ≥ LC50/EC50/ChV > 1.

Harmful: 100 ≥ LC50/EC50/ChV > 10. Not Harmful: LC50/EC50/ChV > 100.

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