Supporting information's on

Synthesis of solar light active reduced graphene oxide-ZnS nanomaterial for photocatalytic degradation and antibacterial applications

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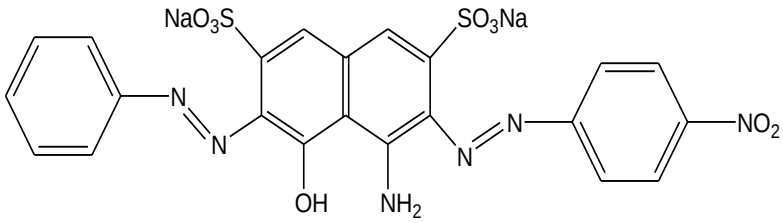

Figure S1. Chemical Structure of Naphthol Blue Black dye (NBB)

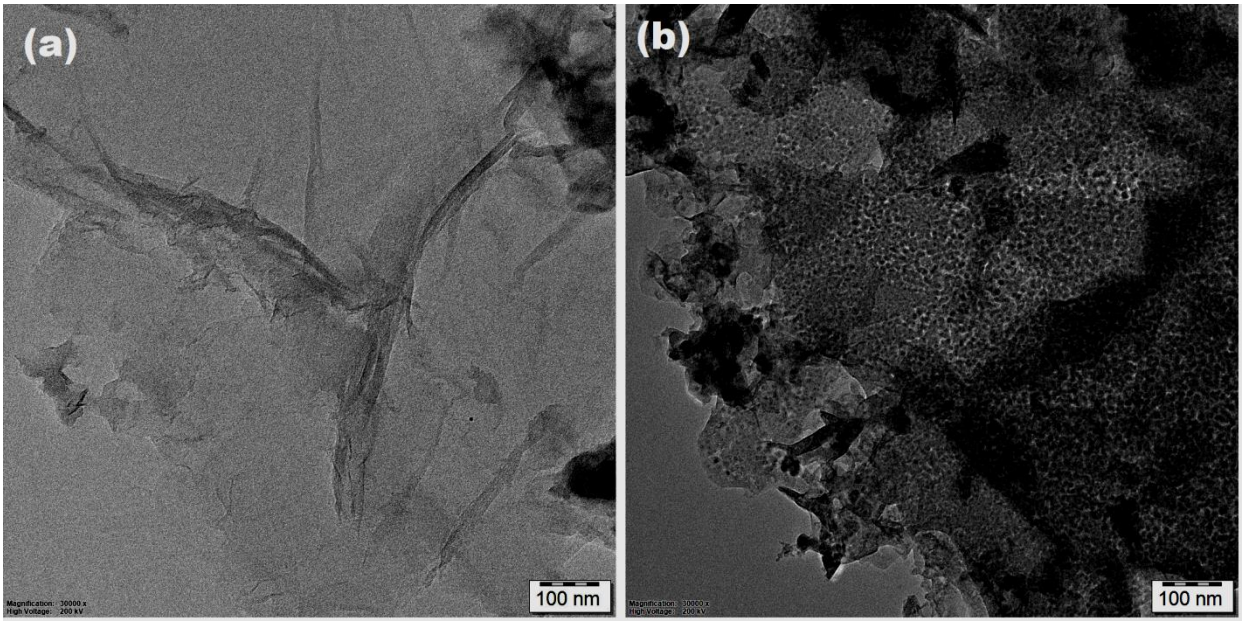

Figure S2. HR-TEM images of (a) rGO, (b) rGO-ZnS

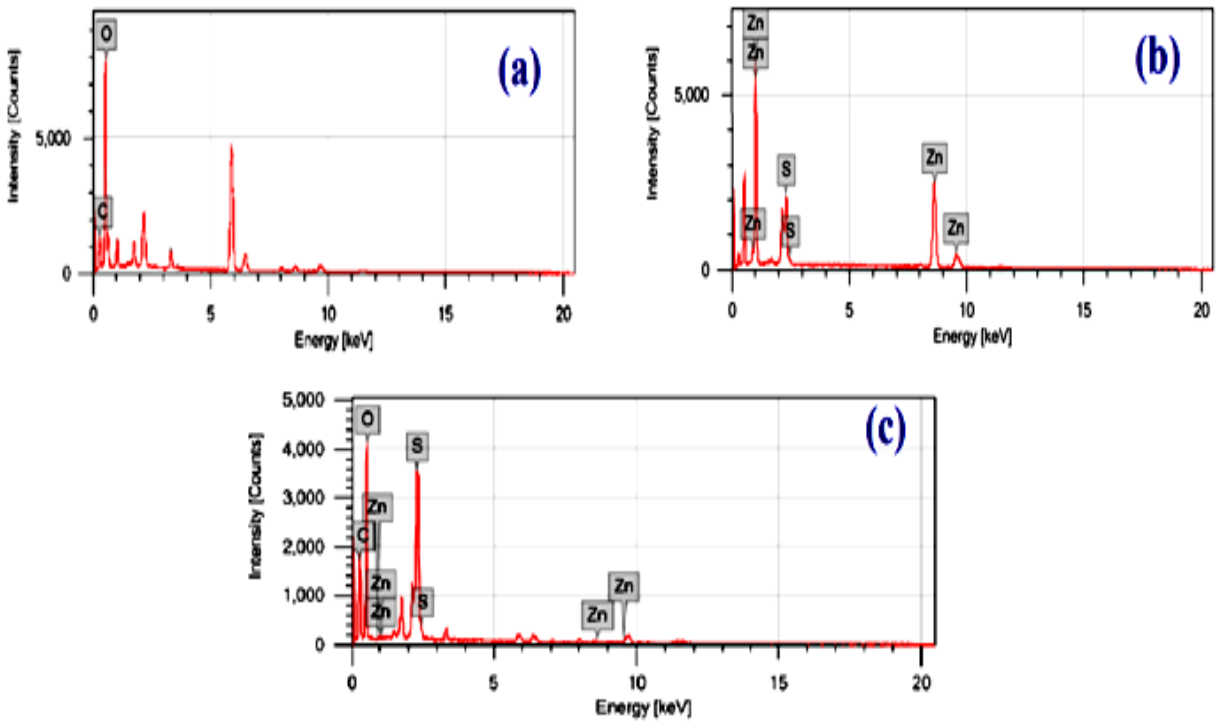

Figure S3. EDX spectra of (a) rGO (b) ZnS (c) rGO-ZnS

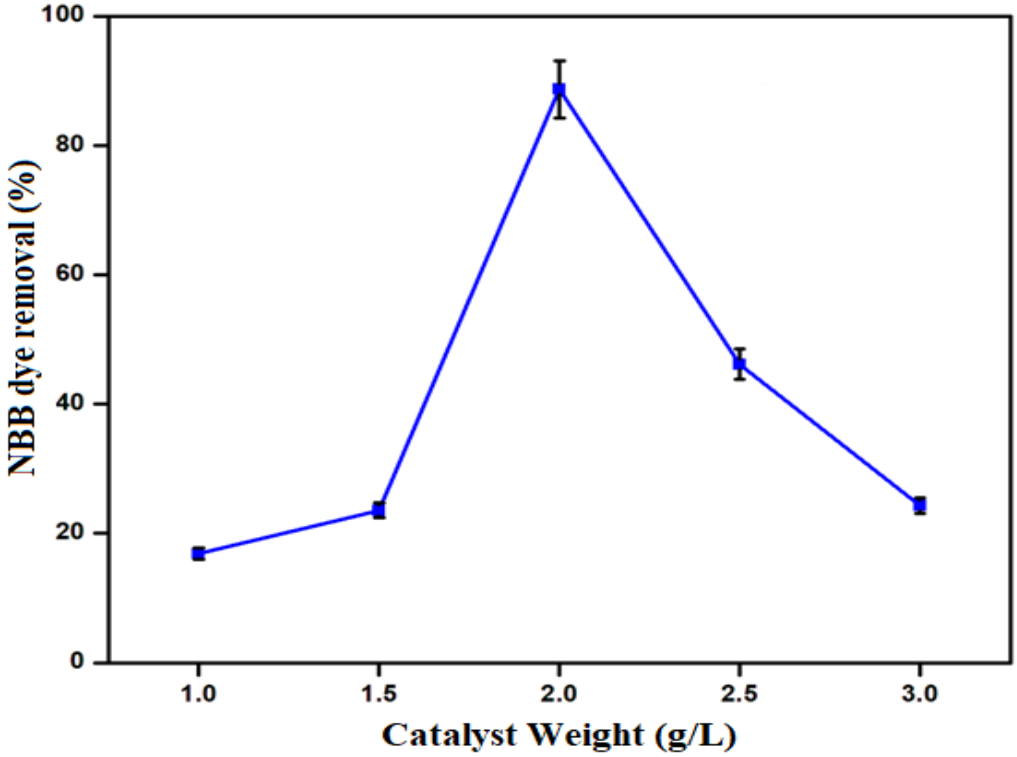

Figure S4. Effect of catalyst weight on the photocatalytic degradation of NBB using solar light: [NBB] = 2×10^{-4} mol/L, pH = 7.0±0.1, airflow rate = 8.1 mL s^{-1}, irradiation time = 90 min, I_{solar} = 1250 × 100 ± 100 lux.

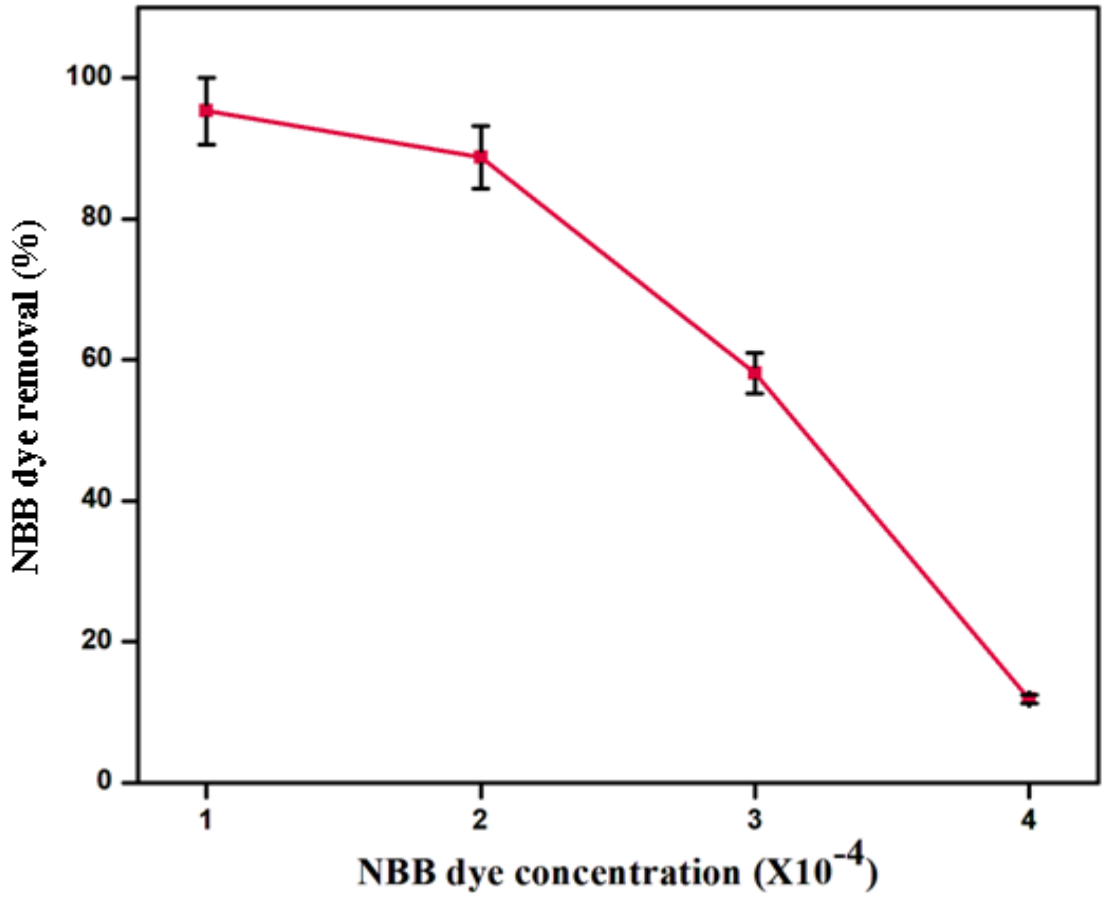

Figure S5. Effect of various initial dye concentrations on the degradation of NBB using solar light/rGO-ZnS nanoparticles: pH = 7.0±0.1, rGO-ZnS nanoparticles = 2g/L, airflow rate = 8.1 mL s^{-1}, irradiation time = 90 min, I_{solar} = 1250 × 100 ± 100 lux.

Table S1. Effect of different wt% of rGO on ZnS for the NBB dye degradation under solar light

Wt% rGO	% of NBB dye degradation
9.3	74.8
11.4	78.5
13.3	88.7
15.2	69.6
17.0	53.7

[NBB] = 2 $\times 10^{-4}$ mol/L, catalyst suspended = 2 g/L, pH = 7, airflow rate = 8.1 mL s^{-1}, irradiation time = 90 min.

The photocatalytic activities of the rGO-ZnS catalysts with 9.3, 11.4, 13.3, 15.2 and 17.0 wt% of rGO loading were evaluated by the degradation of NBB under solar light and the results are given in **Table S1**. As the concentration of rGO is increased from 9.3 to 13.3 wt%, the percentage of degradation increased from 74.8 to 88.7% in NBB degradation. Catalyst loaded with 13.3 wt% of rGO shows a higher percentage of degradation. Further increase of rGO content decreases the percentage of degradation. Hence, 13.3 wt% of rGO is found to be optimum concentration of rGO in ZnS.

Table S2. Rate constants of photocatalytic degradation of NBB dye using solar light/rGO-ZnS nanoparticles

[NBB] x10^{-4} mol/L	**k'(min^{-1})**
1	0.0198
2	0.0148
3	0.0101
4	0.0080

Table S3. Comparison of different modified ZnS towards pollutant degradation

S.No	**Catalysts**	**Light source**	**Pollutants/ Concentration**	**Catalyst amount**	**%Degradation/ time (min)**	**Ref.**
1	ZnO@ZnS	18 W- UV, 265 nm	CR/40 ppm	50 mg/ 100 mL	89/120	[S1]
2	ZnS@WO_3@ $CoFe_2O_4$	Tungsten halogen lamp (simulated sunlight), > 400 nm	MB/50 ppm	50 mg/-	95.97/120	[S2]
3	CdS/ZnS QDs	Sunlight, 1048 Wm^{-2}	IC/10 ppm	100 mg/ 100 mL	87.2/360	[S3]
4	Ag_2WO_4 decorated ZnS	800 W halogen lamp, visible light	MB/10 ppm	3 mg/ 20 mL	84/140	[S4]
5	ZnS/MoS_2/Bi_2WO_6	500 W Xe lamp	RhB/10 ppm	20 mg/ 50 mL	91.1/120	[S5]
6	rGO-ZnS	Solar light (1250X100±100 lux)	NBB/(2 x 10^{-4}M)*	100 mg/50 mL	93.7/150	Present work

CR- Congo red; MB- Methylene blue; IC- Indigo carmine; RhB- Rhodamine B; NBB- Naphthol blue black; *- concentration given in molar

References

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