Supplementary information

For

Phase-controlled green synthesis of wurtzite ($P6_3{}_{mc}$) ZnO nanoparticles: Interplay of green ligands with precursor anions, anisotropy, and Photocatalysis

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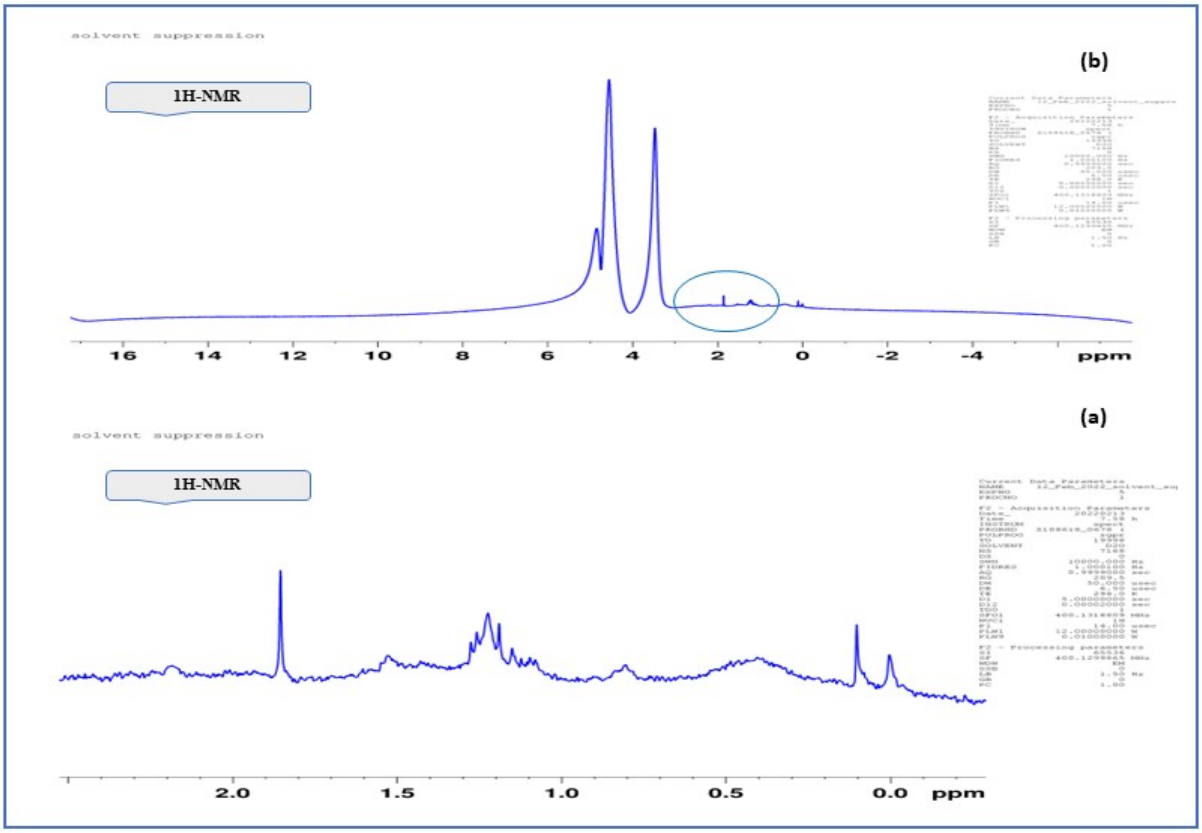
Total number of tables: 1


solvent suppression
1H-NMR
(b)
16
14
12
10
8
6
4
2
0
-2
-4
ppm
(a)
solvent suppression
1H-NMR
2.0
1.5
1.0
0.5
0.0
ppm

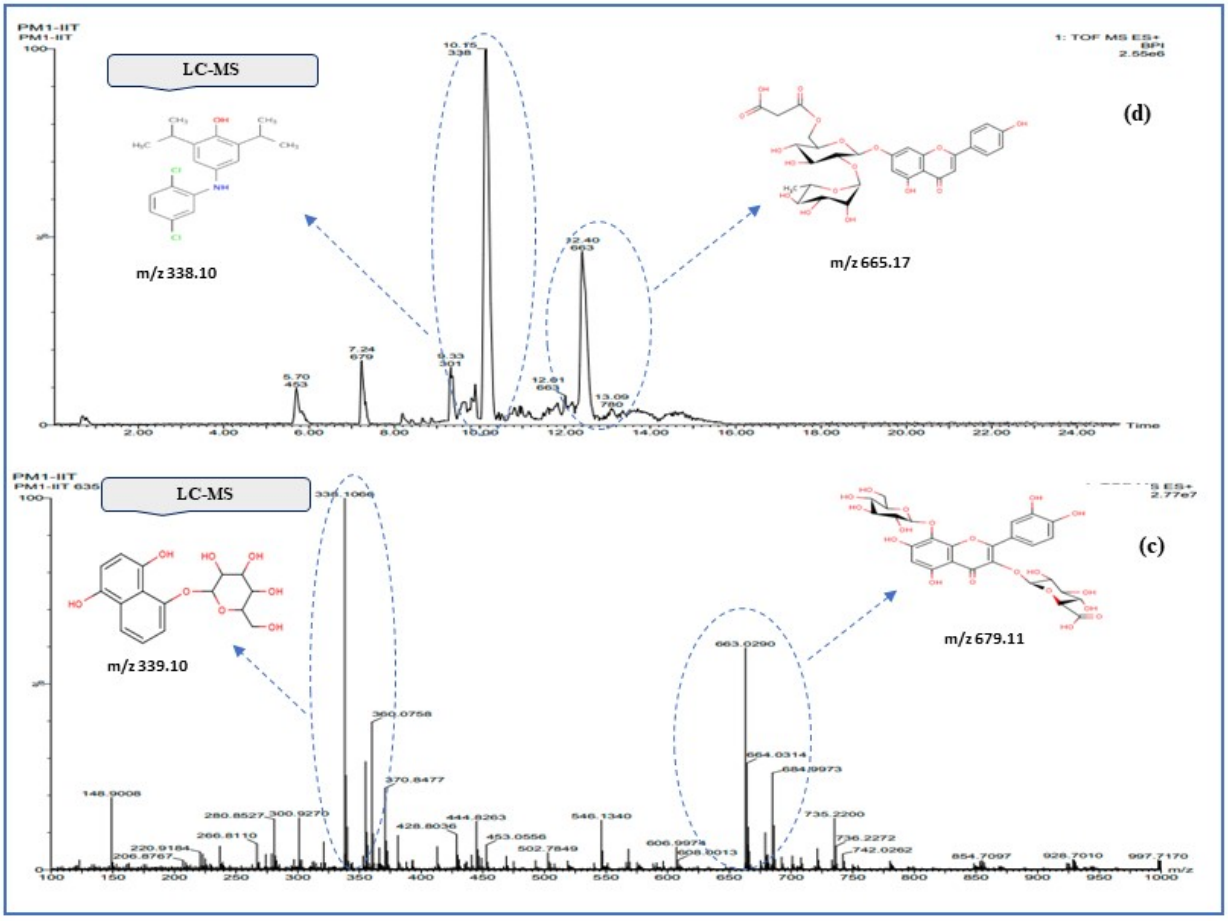
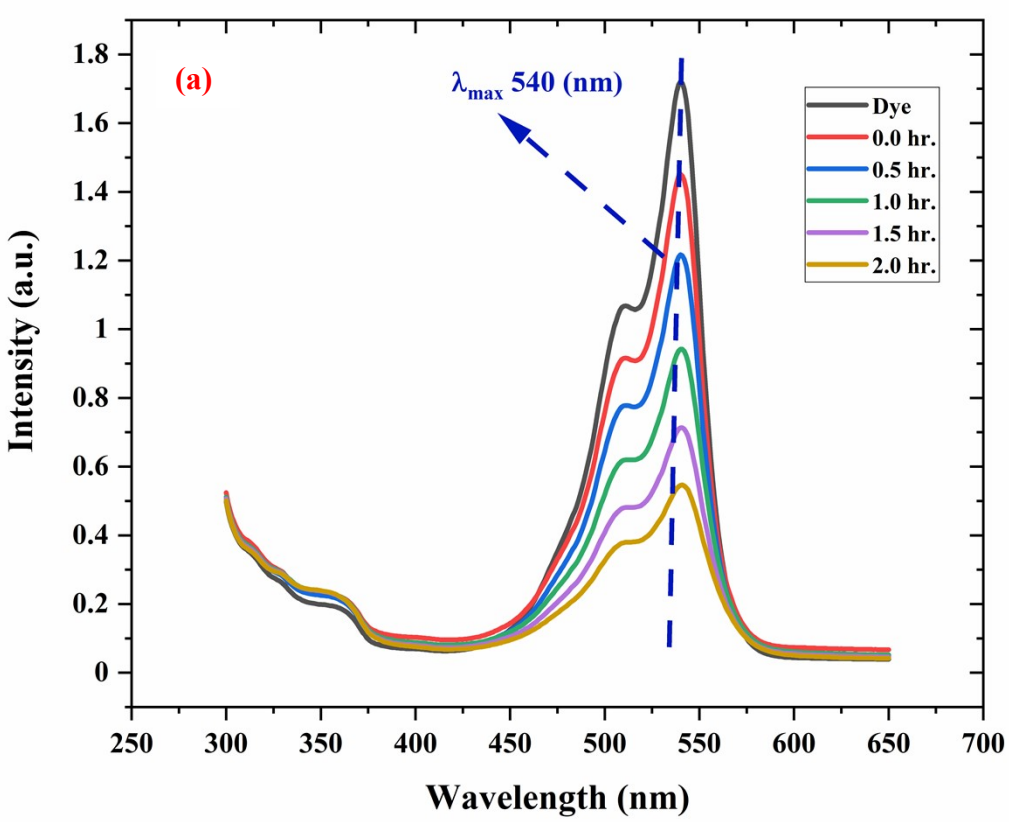
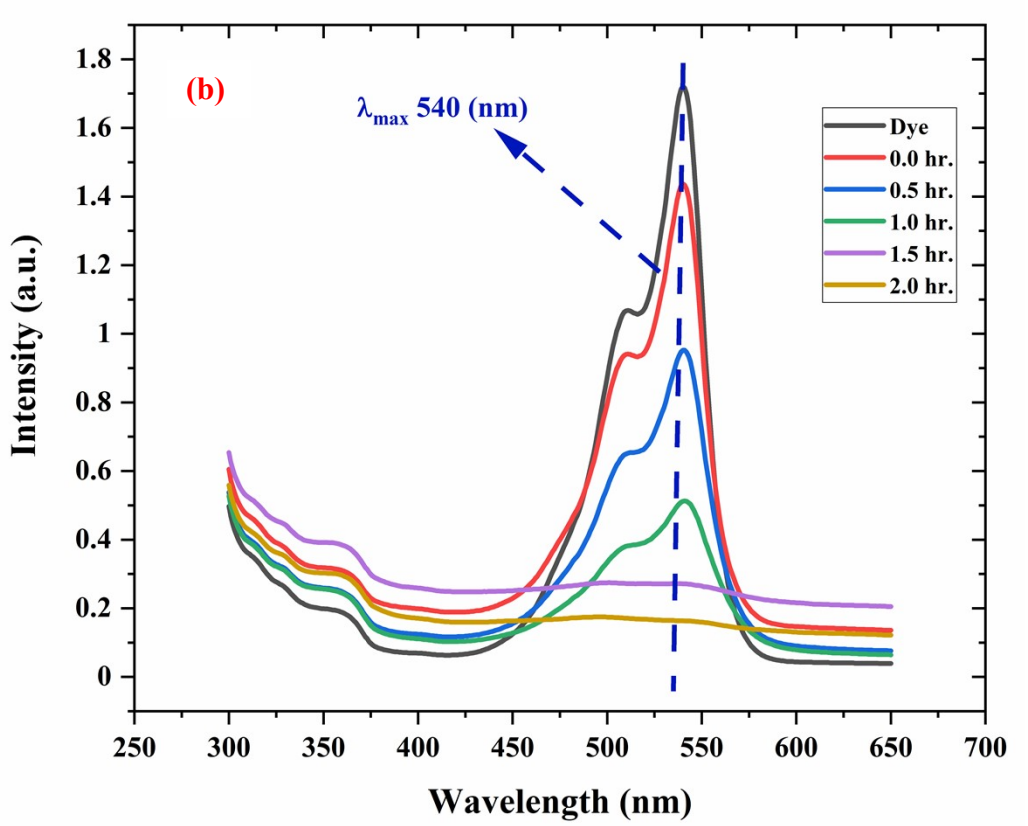
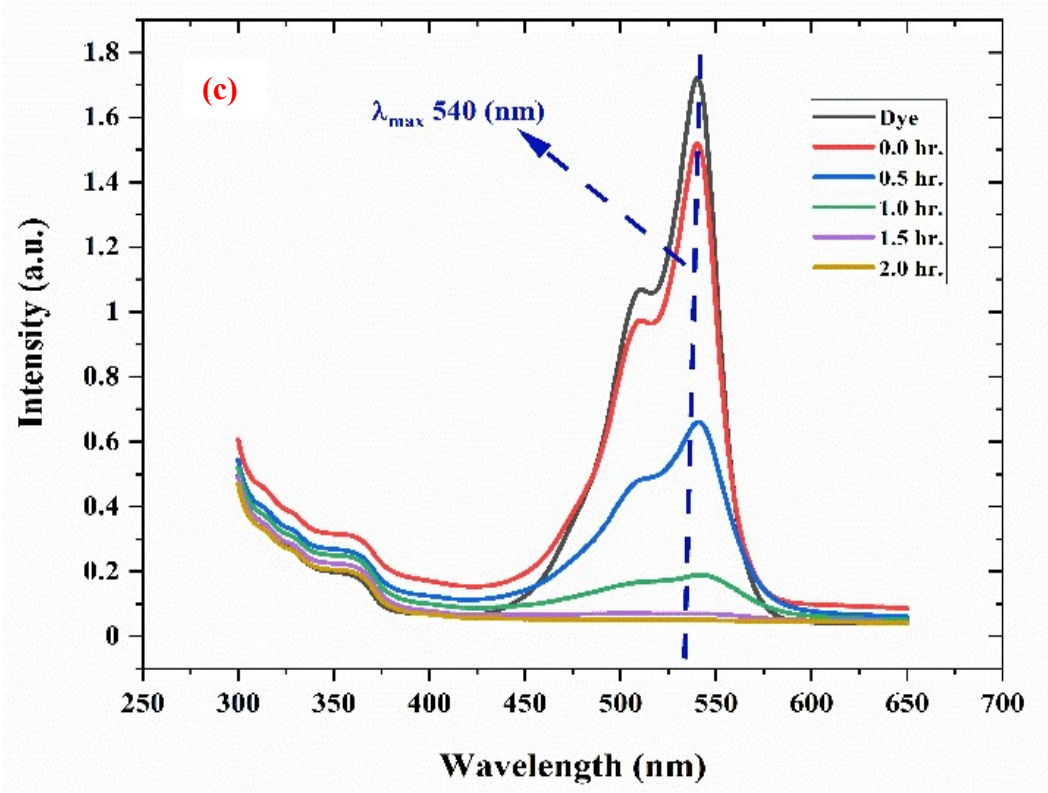


Fig. S1 (a-d) LC-MS Chromatogram and mass spectrum of sugar press mud water extract (c &d) the significant peaks at (retention time 10.15 and 12.40 min in chromatogram (c) corresponds the most probable compound (polyphenolic) in SPM water extract with $[M+H]^+$ peak having m/z 338.10/ 339.10 and m/z 679.11/665.17 respectively. H1NMR spectrum (a-b) with proton signal with chemical shifts in the range of (δ 0.0 -6.0 ppm) indicate Sp3 (C-H) and Sp2 (C-H), which support the m/z peaks of LC-MS for the probable compounds in the inset. The compound in the inset figure has been screened out based on m/z values from the mass library (Metlin.)


(a)
λmax 540 (nm)
Dye
0.0 hr.
0.5 hr.
1.0 hr.
1.5 hr.
2.0 hr.
Intensity (a.u.)
Wavelength (nm)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
250
300
350
400
450
500
550
600
650
700


(b)
λmax 540 (nm)
Dye
0.0 hr.
0.5 hr.
1.0 hr.
1.5 hr.
2.0 hr.
Intensity (a.u.)
Wavelength (nm)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
250
300
350
400
450
500
550
600
650
700


(c)
λmax 540 (nm)
Dye
0.0 hr.
0.5 hr.
1.0 hr.
1.5 hr.
2.0 hr.
Intensity (a.u.)
Wavelength (nm)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
250
300
350
400
450
500
550
600
650
700

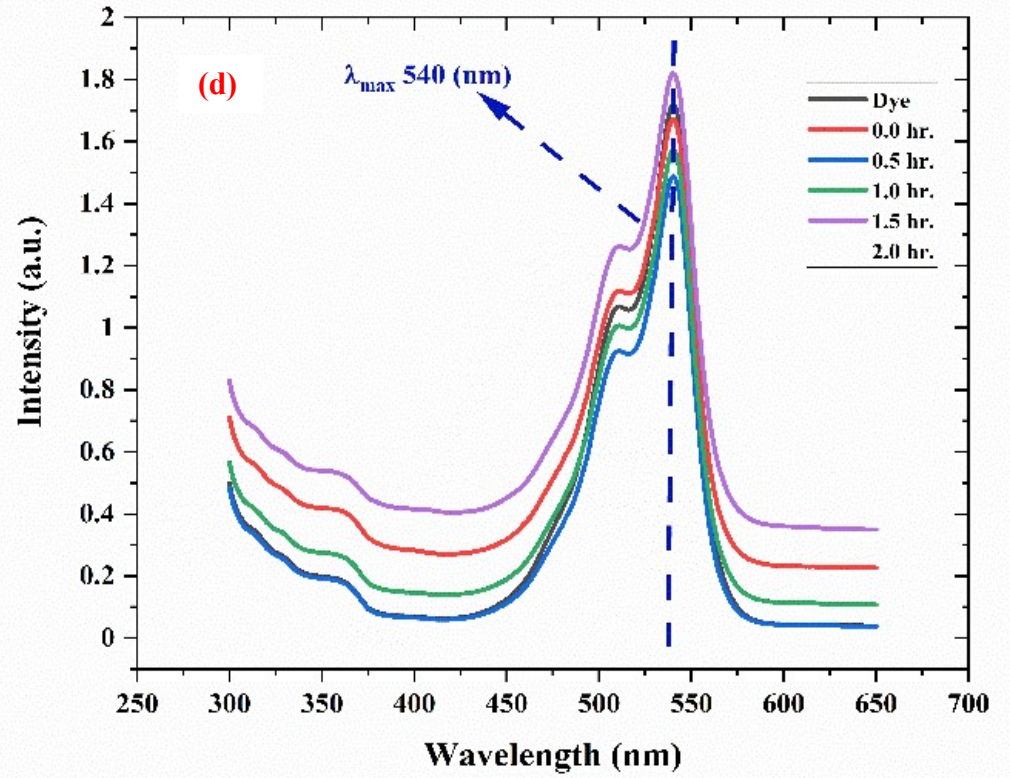
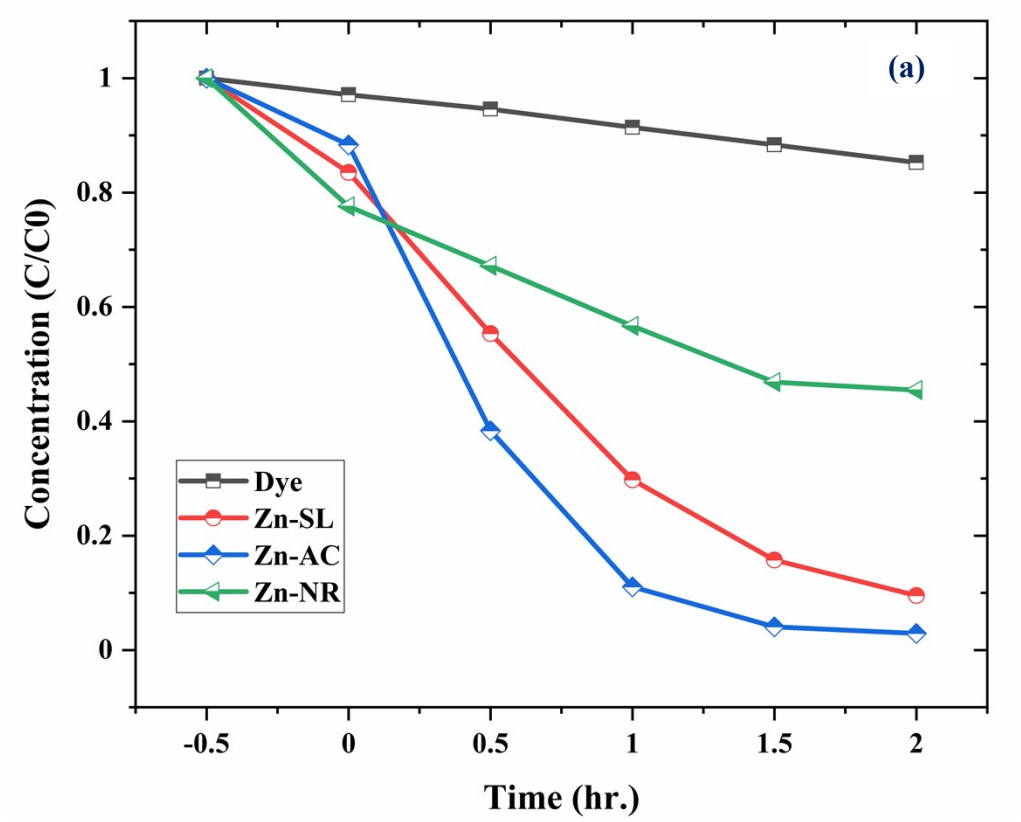


Fig. S2 (a-d) Uv- visible absorption spectrum of rhodamine dye (conc.0.596x 10^{-3}) degradation while testing the cyclic reusability of the catalyst of the different photocatalysts (conc. 0.9g/ L) suspension system under direct sunlight exposure recorded at the time interval of 0.5 hr. fig. Fig.11 (a) corresponds to Zn-NR catalyst system fig.11 (b) corresponds to Zn-SL catalyst system; like-wise 11(c) to Zn-AC; and fig.11 (d). control experiment (dye-catalyst system in the dark);


(a)
Concentration (C/C0)
Time (hr.)
Dye
Zn-SL
Zn-AC
Zn-NR
1
0.8
0.6
0.4
0.2
0
-0.5
0
0.5
1
1.5
2

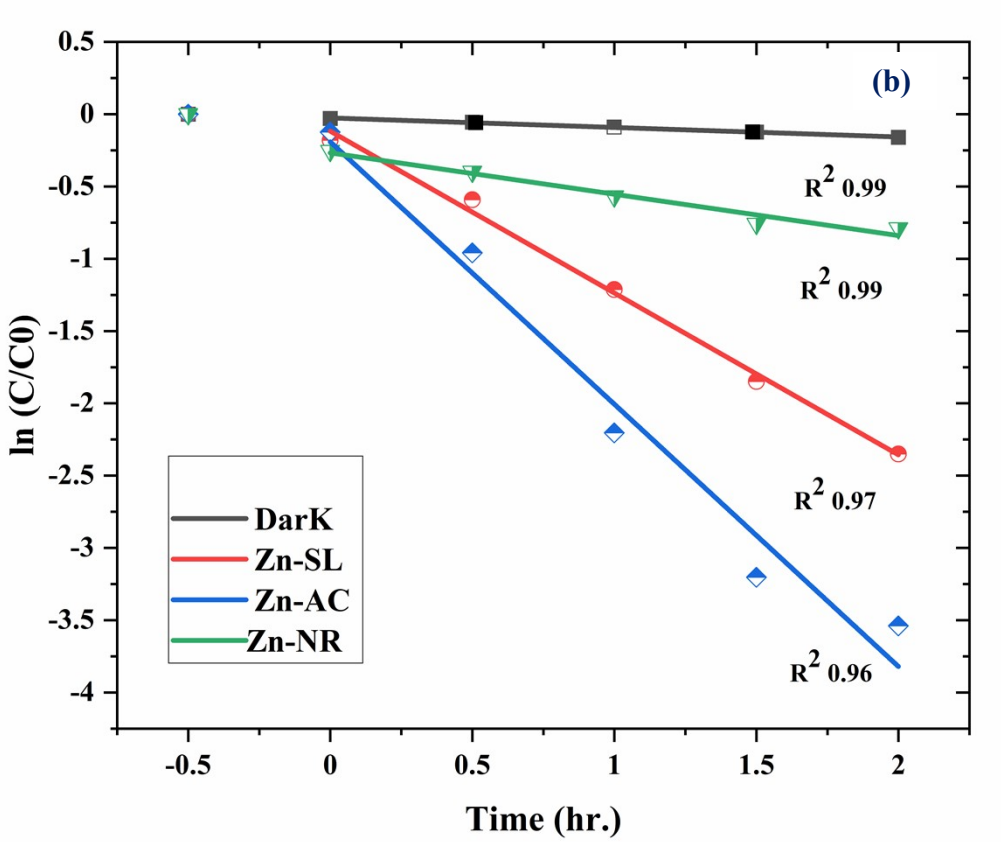
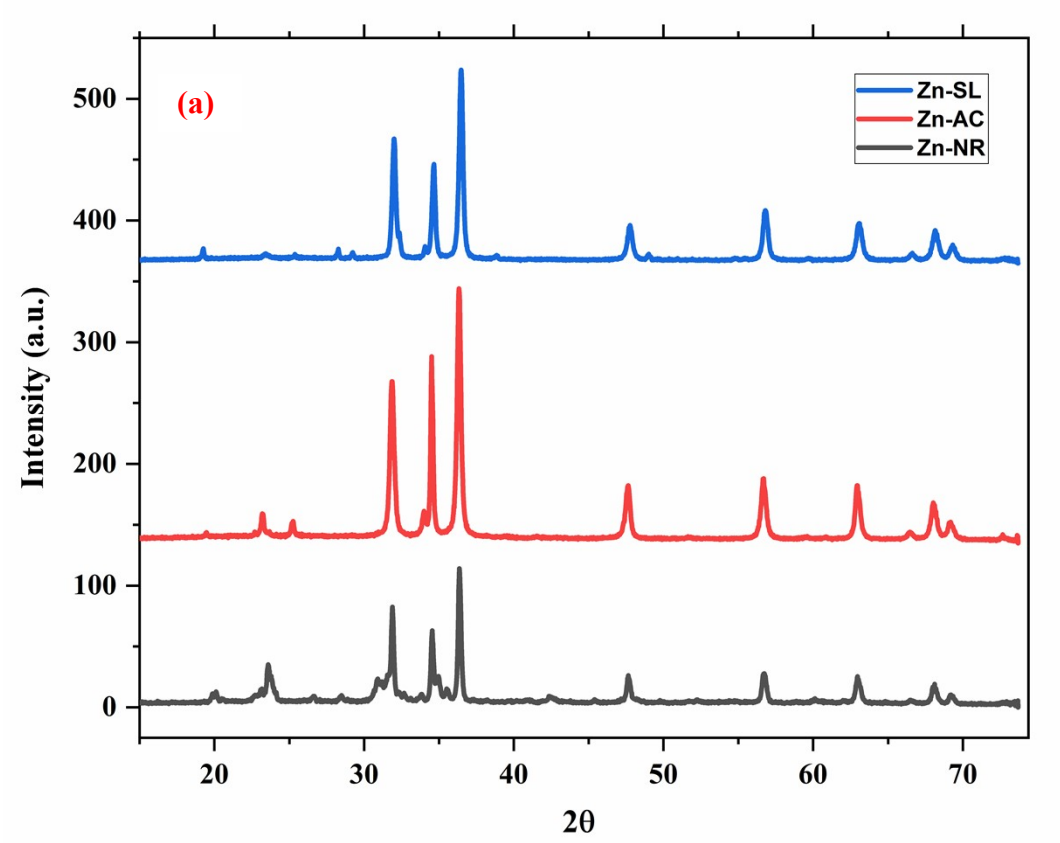


Fig. S3 (a-b) Concentration (C/C0) vs. time plot (fig.12 (a) showing a differential decrease in dye concentration with time for different catalyst systems. Fig.12 (b) plot (ln C/C0) vs time shows pseudo-first order kinetics with slope (rate constant 'k') in the range of (m= -0.06581 to -1.81453). with the R^2 values in the range of 0.95 to 0.99.

Table S1 The catalyst system and the corresponding rate constant for RhB dye degradation reaction.

Catalyst system	**Rate constant (min^{-1})**	**AverageTemperature range (˚C)**	**Initial conc.(C_0)**
Dark	-0.06581	34—37	$0.596x10^{-3}$
Zn-SL	-1.11947	34—37	$0.596x10^{-3}$
Zn-AC	-1.81453	34—37	$0.596x10^{-3}$
Zn-NR	-0.28606	34—37	$0.596x10^{-3}$


(a)
Zn-SL
Zn-AC
Zn-NR
Intensity (a.u.)
0
100
200
300
400
500
20
30
40
50
60
70
2θ

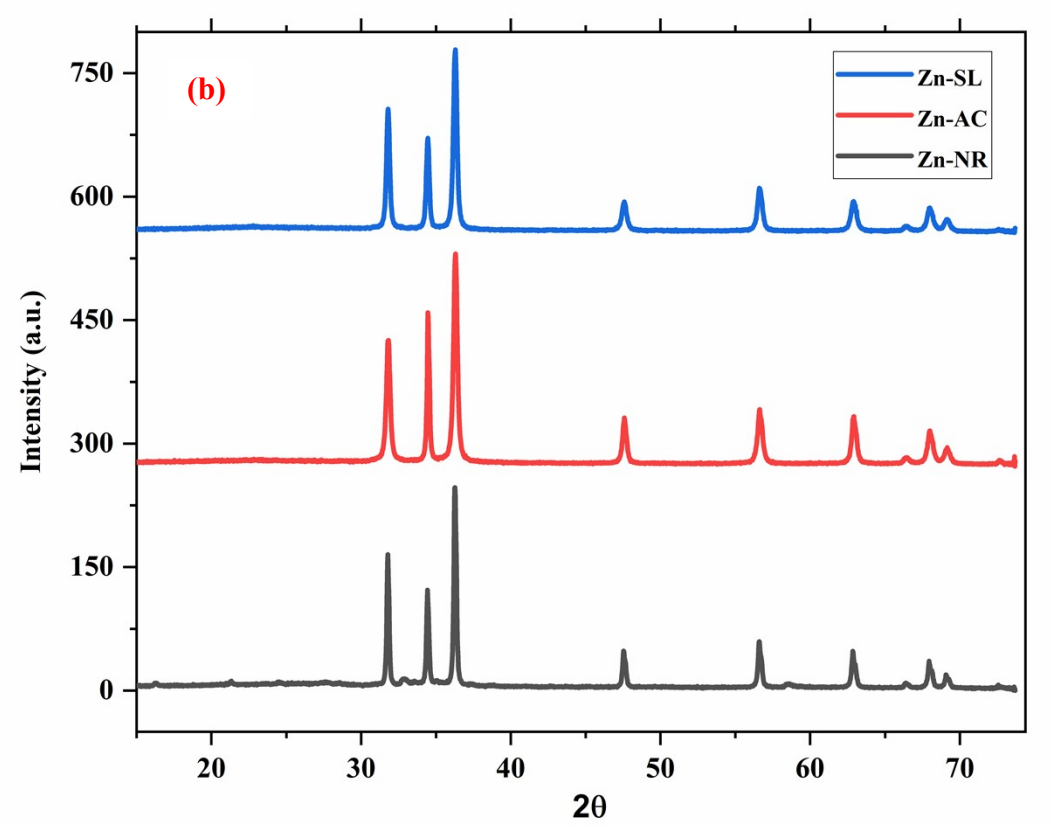


Fig. S4 (a-b) The x-ray diffractograms (a &b) of the three structurally different photocatalysts (NPs of ZnO); (a) diffractograms before the use of catalyst in photocatalysis; (b) After the use of the catalyst in photocatalysis; demonstrating structural integrity of the catalyst over repeated use.

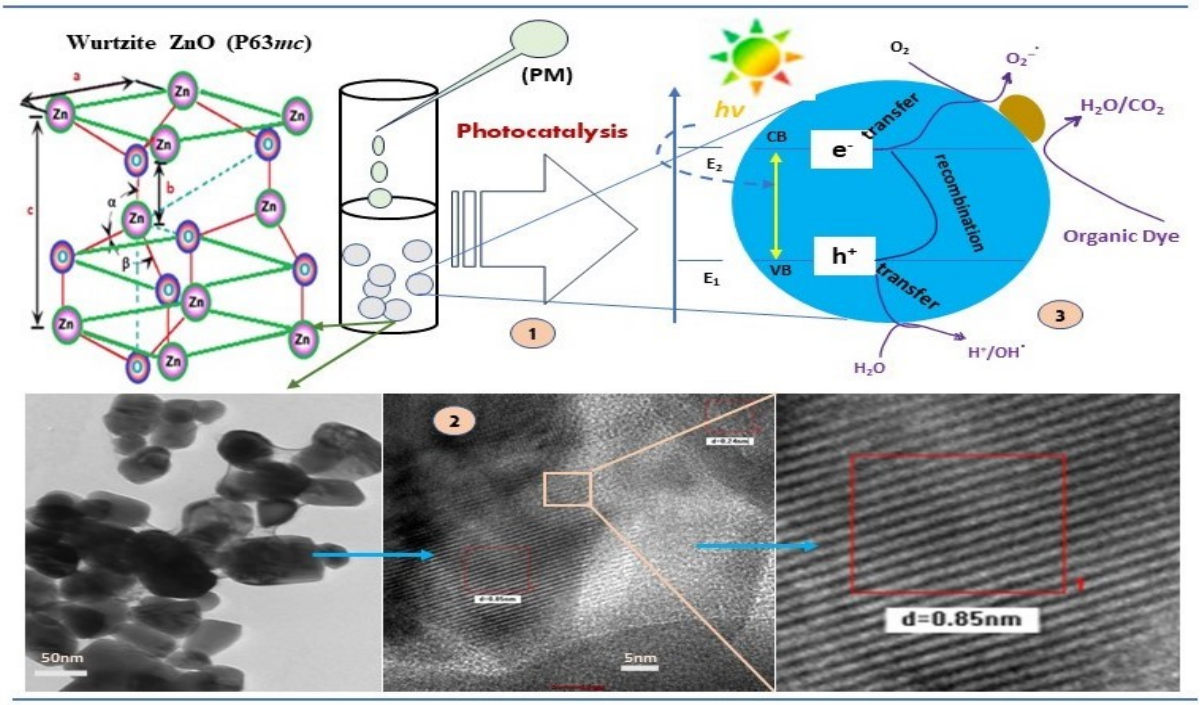


Fig. S5 schematic diagram describing synthesis, characterization and photocatalysis