

## Supplementary Material

### **Nd-doped ZnO nanostructures with enhanced photocatalytic performance for environmental protection**

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#### *3.3. Characterization of the prepared materials*

The crystalline structures of nanomaterials were analyzed using an 9kW Rigaku SmartLab XRD diffractometer- (Rigaku Corporation, Japan). The powder XRD patterns were recorded in 2 $\theta$  mode with step of 0.01° and speed of 12°/min. SEM micrographs were obtained using Verios G4 UC Scanning Electron Microscope (Thermo Fisher Scientific) equipped with an energy dispersive spectrometer (EDS, EDAX Octane Elite). Diffuse reflectance spectra (DRS) were recorded by Analytik Jena SPECORD UV–Vis 210+ spectrophotometer, equipped with an integrating sphere accessory, in a wavelength range of 200-1100 nm. Photoluminescence spectra were assessed using a Perkin Elmer LS55 (PerkinElmer) spectrophotometer.

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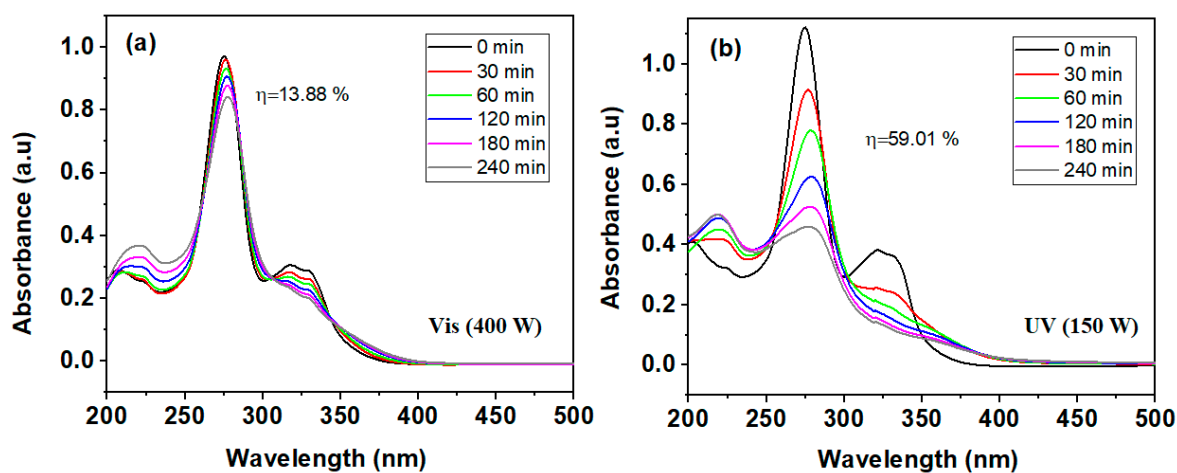
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**Table S1.** Kinetic rate constants determined for each run of DoE.

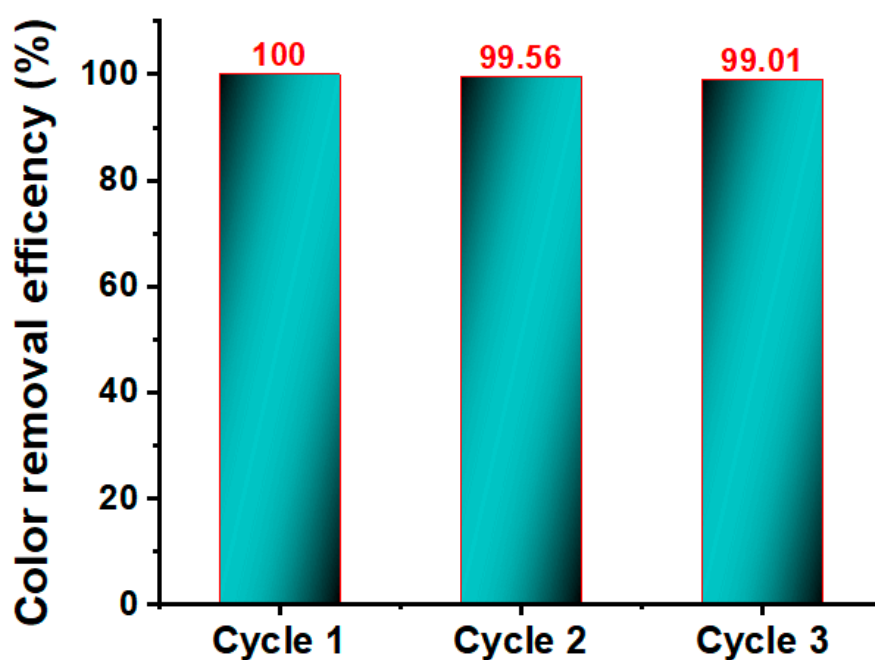
Run	Fitted Model	Rate constant, $k$ (min <sup>-1</sup> )	Error function, $\epsilon^2$
1	PFO <sup>*)</sup>	$2.072 \times 10^{-2} \text{ min}^{-1}$	0.178
2	PFO-SC <sup>**) )</sup>	$2.875 \times 10^{-2} \text{ min}^{-1}$	3.886
3	PFO	$2.765 \times 10^{-2} \text{ min}^{-1}$	0.454
4	PFO-SC	$4.346 \times 10^{-2} \text{ min}^{-1}$	4.851
5	PFO	$4.225 \times 10^{-2} \text{ min}^{-1}$	0.684
6	PFO-SC	$4.743 \times 10^{-2} \text{ min}^{-1}$	4.150
7	PFO-SC	$1.242 \times 10^{-2} \text{ min}^{-1}$	3.167
8	PFO	$1.517 \times 10^{-2} \text{ min}^{-1}$	1.614
9	PFO-SC	$1.241 \times 10^{-2} \text{ min}^{-1}$	1.474
10	PFO-SC	$1.401 \times 10^{-2} \text{ min}^{-1}$	1.293
11	PFO-SC	$1.230 \times 10^{-2} \text{ min}^{-1}$	0.984

<sup>\*)</sup> PFO kinetic model:  $C(t)=C_0 \times \exp(-kt)$

<sup>\*\*) )</sup> PFO-SC kinetic model:  $C(t)=(C_0 - C_s) \times \exp(-kt) + C_s$  , where  $C_s$  is the portion of organic pollutant which is stable.



**Fig. S1.** UV-VIS absorption spectra of the photolysis test for Ciprofloxacin pollutant performed under visible (a) and UV (b) light irradiation for 240 minutes.



**Fig. S2.** Reuse of ZnO:Nd(0.1%) material for three cycles to remove MB after 120 min of visible light irradiation.