Electronic Supplementary Material (ESI) for Materials Advances.

Supplementary Information

Crystal Lattice Engineering in Screw-dislocated ZnO Nanocone Photocatalyst by Carbon Doping

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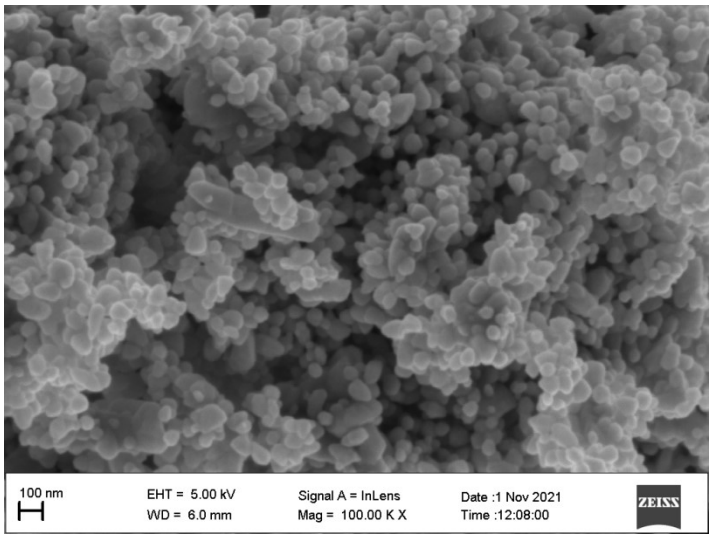

Figure S1. SEM image of ZnO synthesised without CTAB

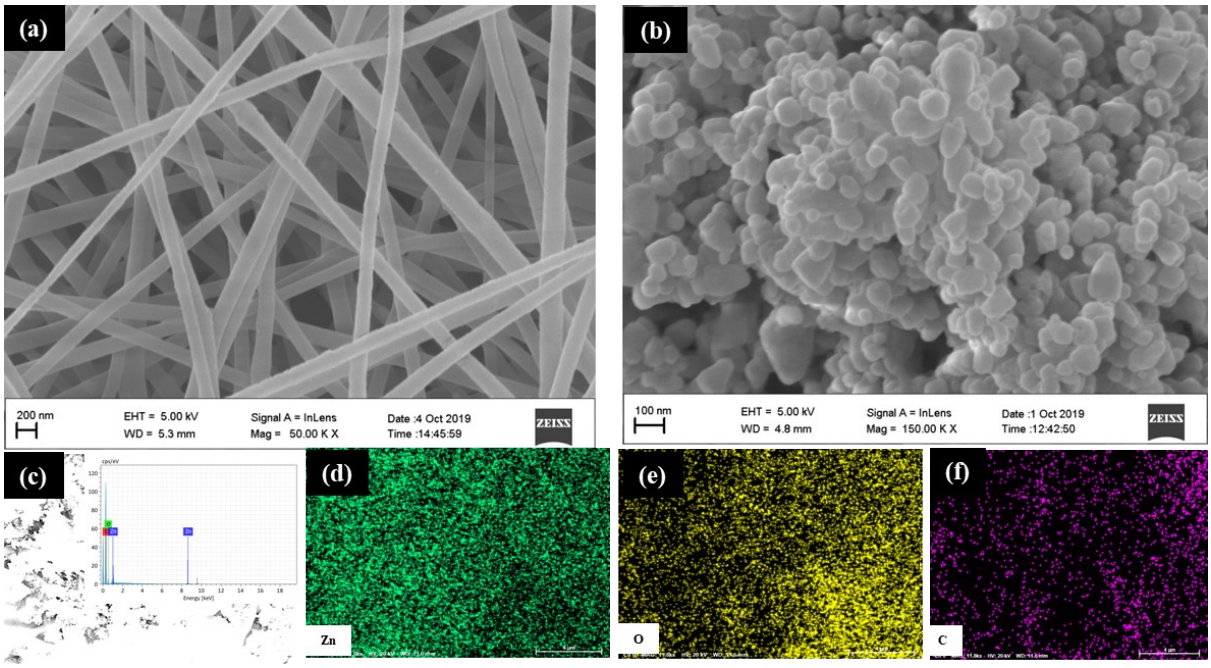

Figure S2. SEM micrographs of electrospun ZnO-PVA nanofibers (Z1P10) (a) before annealing and (b) after annealing. SEM-EDS elemental mapping of Z1P10 sample: (c) Secondary electron image with the inset showing the EDS spectrum, Elemental mapping of (d) Zn, (e) O, and (f) C.

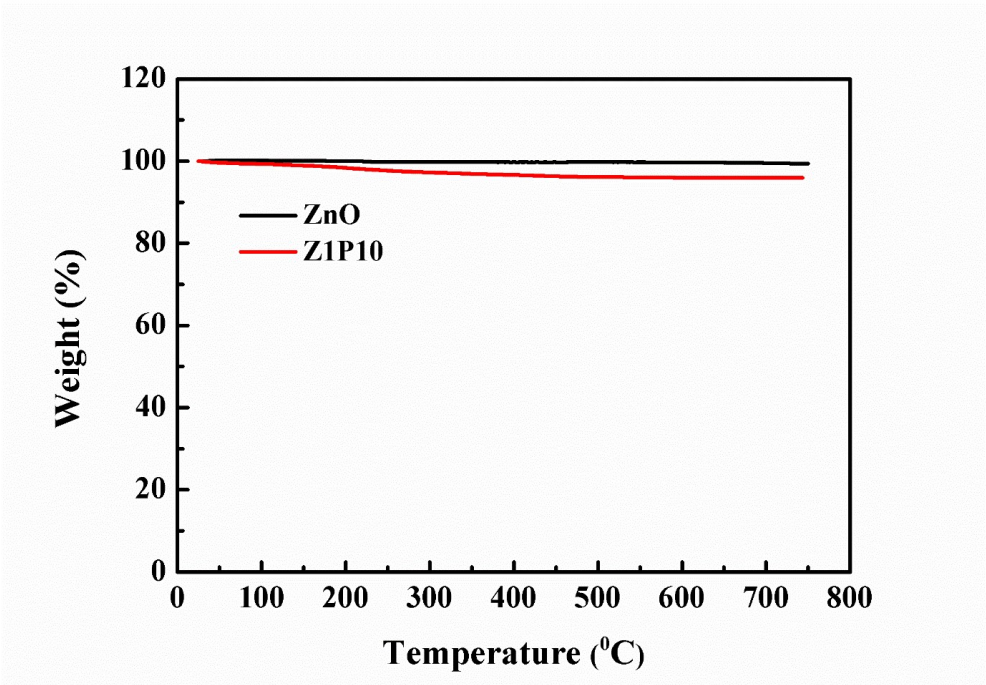

Figure S3. TGA curves of pure ZnO and Z1P10 sample.

The fluorescence lifetime (τ) of CDs was calculated by time-resolved photoluminescence measurements. The decay trace for samples was fitted using tri-exponential functions Y(t) based on non-linear least squares analysis in Equation.

$$Y(t) = A_1 \exp\left(-\frac{t}{\tau_1}\right) + A_2 \exp\left(-\frac{t}{\tau_2}\right) + A_3 \exp\left(-\frac{t}{\tau_3}\right)$$

Where A_1, A_2 and A_3 are the fractional contributions of decay lifetimes τ_1, τ_2 and τ_3 respectively. The average lifetime <τ> is calculated using the equation

$$<\tau> = \sum_{i=1}^{3} \frac{A_i \tau_i}{A_i \tau_i^2}$$

Table S1. Analysis of average carrier lifetimes of samples

Sample	τ_1 (ns)	A_1 (%)	τ_2 (ns)	A_2 (%)	τ_3 (ns)	A_3 (%)	<τ> (ns)	c^2
ZnO	0.499	-738.71	0.489	831.35	2.86	7.37	1.27	1.12
Z1P7	0.1	866.85	3.28	4.01	0.112	-770.86	3.12	1.20
Z1P10	2.19	14.64	7.29	5.24	0.412	80.12	3.51	1.20

Z1P12	0.097	-4456.41	3.1	4.3	0.095	4552.11	2.99	1.21

The adsorption percentage of the samples can be evaluated by observing the absorbance at λ_{max} . For that 10 mg of photocatalyst was mixed with 10 ppm dye solution and stirred for 30 min at room temperature to reach equilibrium. The estimated amount of dye adsorbed is calculated using the equation $\frac{(A1 - A2)}{A1}$, where A1 is the absorption of blank dye solution and A2 is the absorbance of the sample containing MB solution just after attaining equilibrium. The amount of dye adsorbed on C-ZnO

Table S2. Dye adorption of ZnO and C:ZnO

Sample	Dye adsorption
ZnO	0.08
Z1P7	0.12
Z1P10	0.21
Z1P12	0.04

The adsorption of MB is higher for Z1P10 compared to other samples. The degradation rate of photocatalysts is not directly related to dye adsorption percentage and is totally in agreement with previous reports[1-3]. The order of degradation rate of photocatalysts is Z1P10>Z1P7>Z1P12>ZnO does not follow dye adsorption trend of Z1P10>Z1P7>ZnO>Z1P12.

Table S3. Comparison of concentration of catalyst, concentration of dye and photocatalytic efficiency with the existing literature.

Sample	Degradation efficiency	Weight of photocatalyst	Concentration of dye	Ref
C-doped ZnO/TiO_2 nanocomposite	94% after 45 min Simulated sunlight irradiation	50 mg	Rhodamine B (10 mg L^{-1}, 100 mL)	[4]
Cu-doped ZnO nanoparticles	91.3% after 75 min UV light	25 mg	Methylene blue (100 mL 10 ppm)	[5]

S-doped ZnO nanoparticles	100% after 90 min Halogen lamp, λ>400 nm	100 mg	Rhodamine B (5 ppm)	[6]
g-C_3N_4/Mn doped ZnO nanocomposite	98 % of MB after 60 min Sunlight irradiation	100 mg	Methylene blue (10 mg L^{-1} , 100 mL)	[7]
C-doped ZnO	98% after 120 min Solar-simulated light irradiation	50 mg	10 mg/ L Rhodamine B (RhB) (100mL)	[8]
Gd/N co-doped ZnO	93% after 60 min Solar light irradiation	100 mg	Methylene blue (10 mg L^{-1} , 100 mL)	[9]
C-doped ZnO	97% after 90 min Solar-simulated light irradiation	10 mg	Methylene blue (10 ppm, 40 mL)	This work

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