Electronic Supplementary Information

Stable water soluble photocatalysts based on porphyrin-carbon dots conjugates produce H_2 under visible light irradiation

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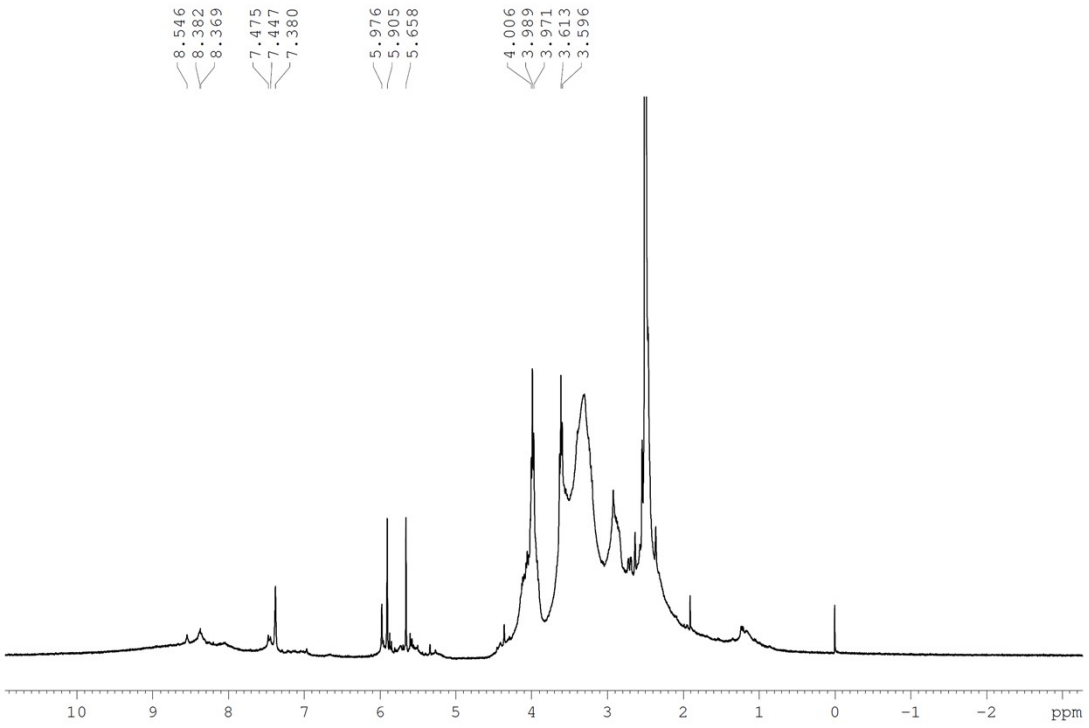

Figure S1. ^{1}H NMR spectrum of **NCDots** in d_6-DMSO.

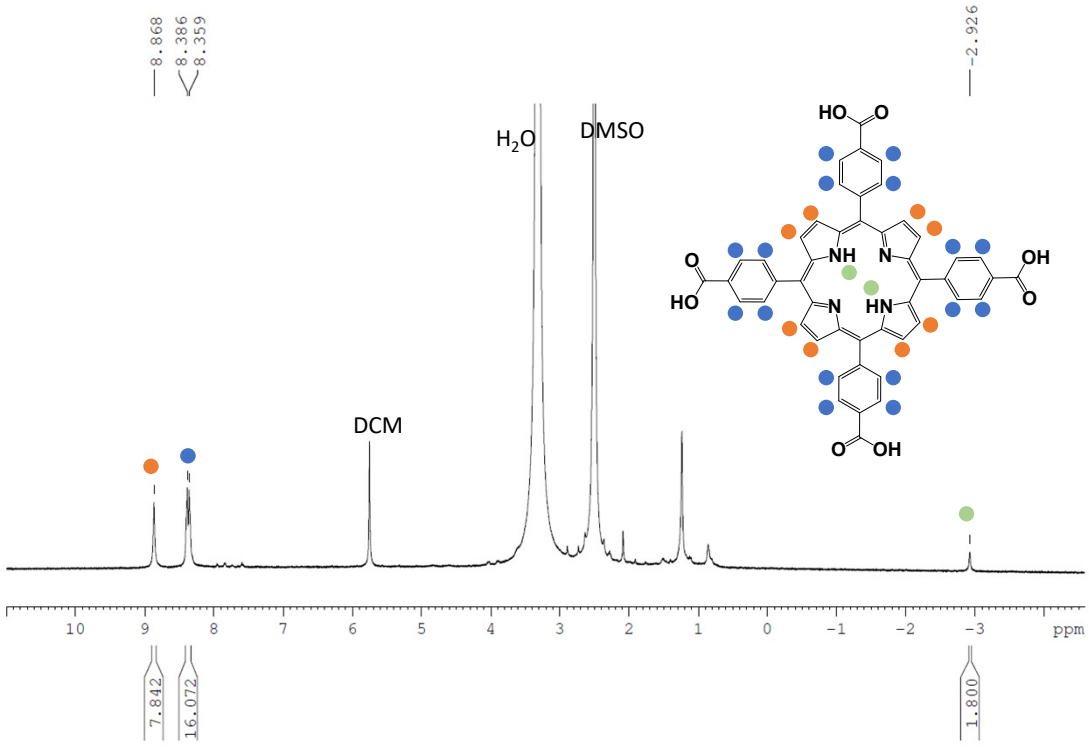

Figure S2. ^{1}H NMR spectrum of compound **TCPP** in d_6-DMSO.

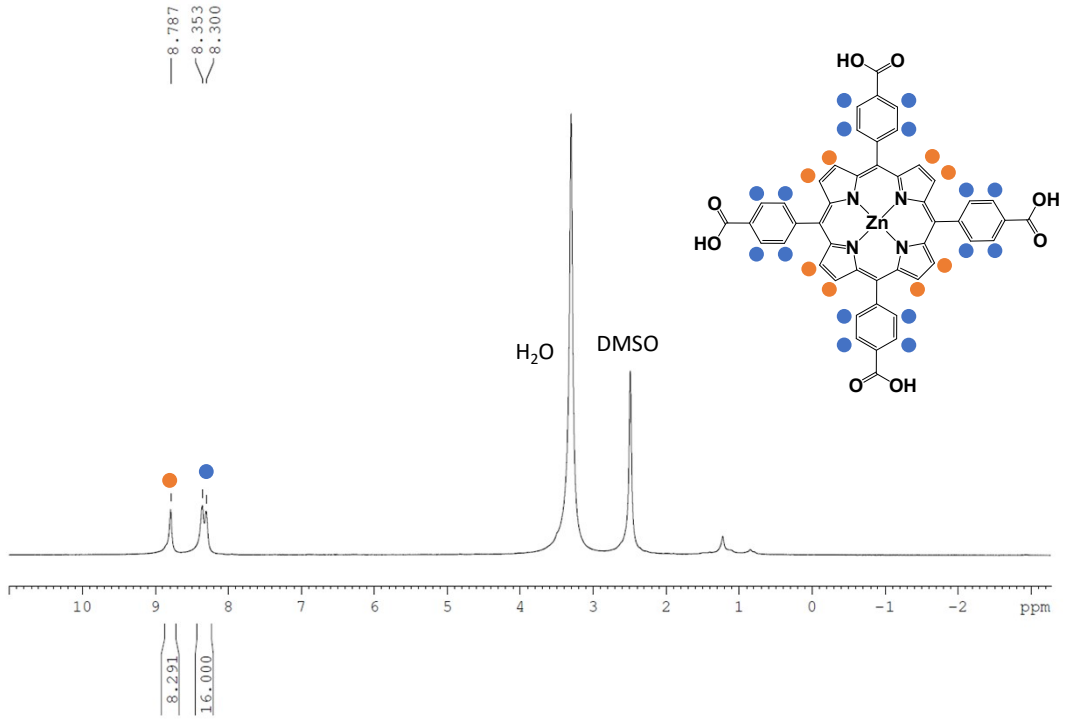

Figure S3. ^{1}H NMR spectrum of compound **ZnTCPP** in d_6-DMSO.

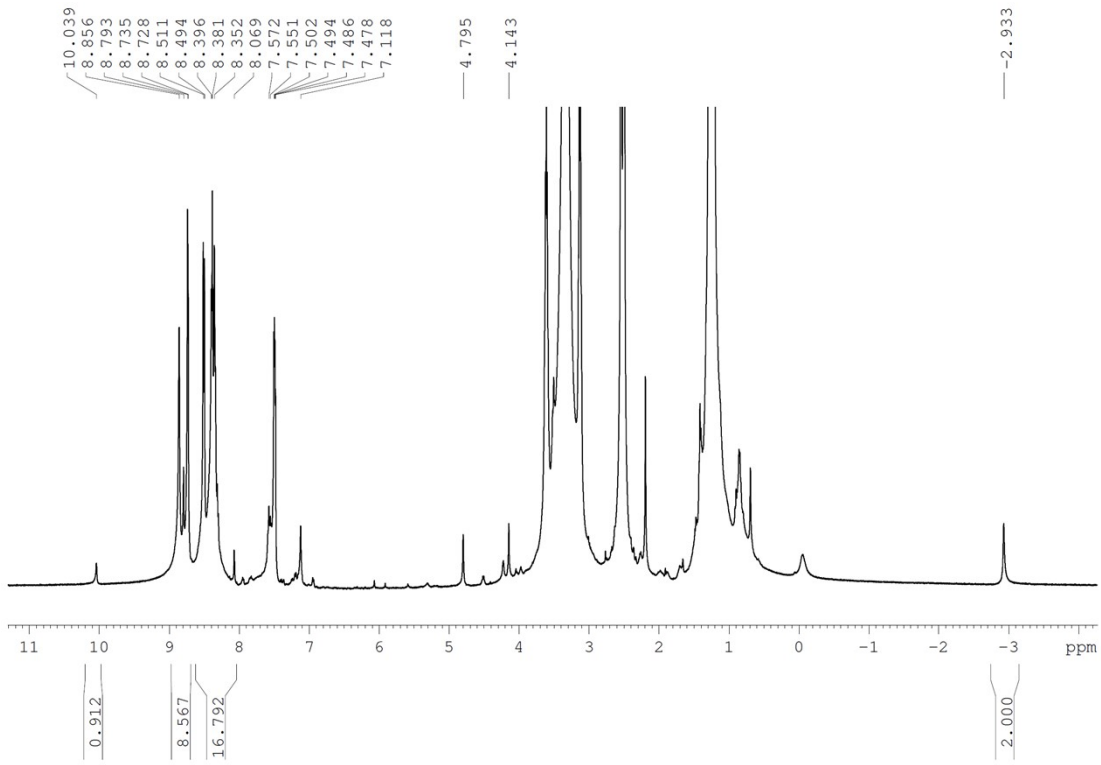

Figure S4. ^{1}H NMR spectrum of compound **TCPP-NCDots** in d_6-DMSO.

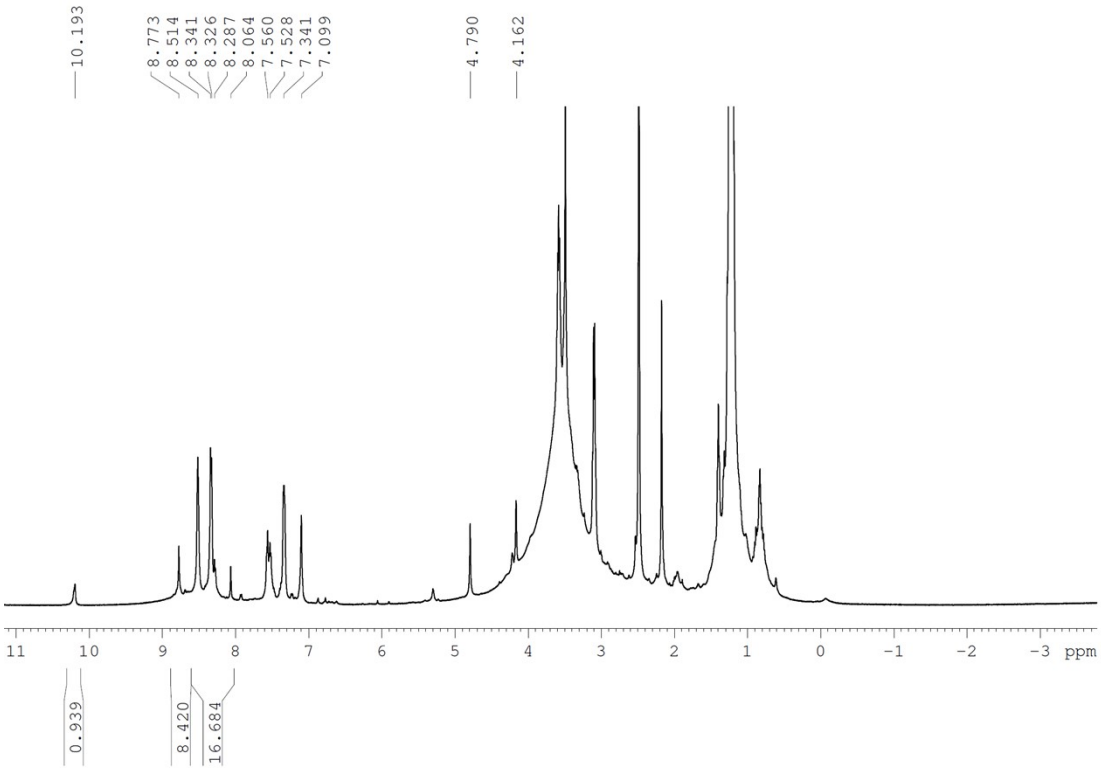

Figure S5. ^{1}H NMR spectrum of compound **ZnTCPP-NCDots** in d_6-DMSO.

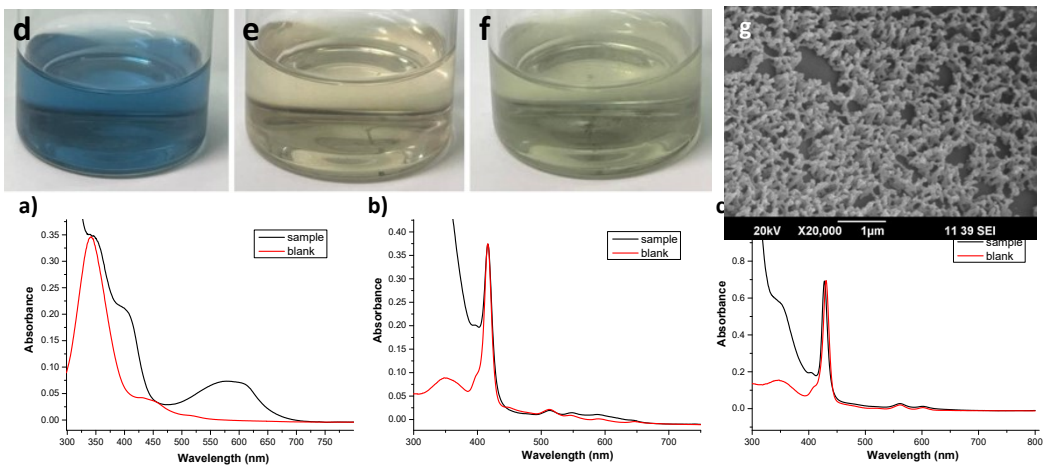

Figure S6. UV-Vis spectra of the sample with ninhydrin and the corresponding blank of Kaiser experiments for a) **NCDots**, b) **TCPP-NCDots** and c) **ZnTCPP-NCDots**. Photos of the samples of d) **NCDots**, e) **TCPP-NCDots** and f) **ZnTCPP-NCDots**. g) SEM image of **NCDots**.

Table S1: Table of concentration (µmol/g) and percentage of free primary amino groups of **NCDots**, **TCPP-NCDots** and **ZnTCPP-NCDots**.

Compound	µmol/gr	% Free -NH_2
1. NCDots	121	100%
2. TCPP-NCDots	12	9.9%
3. ZnTCPP-NCDots	13	10.7%

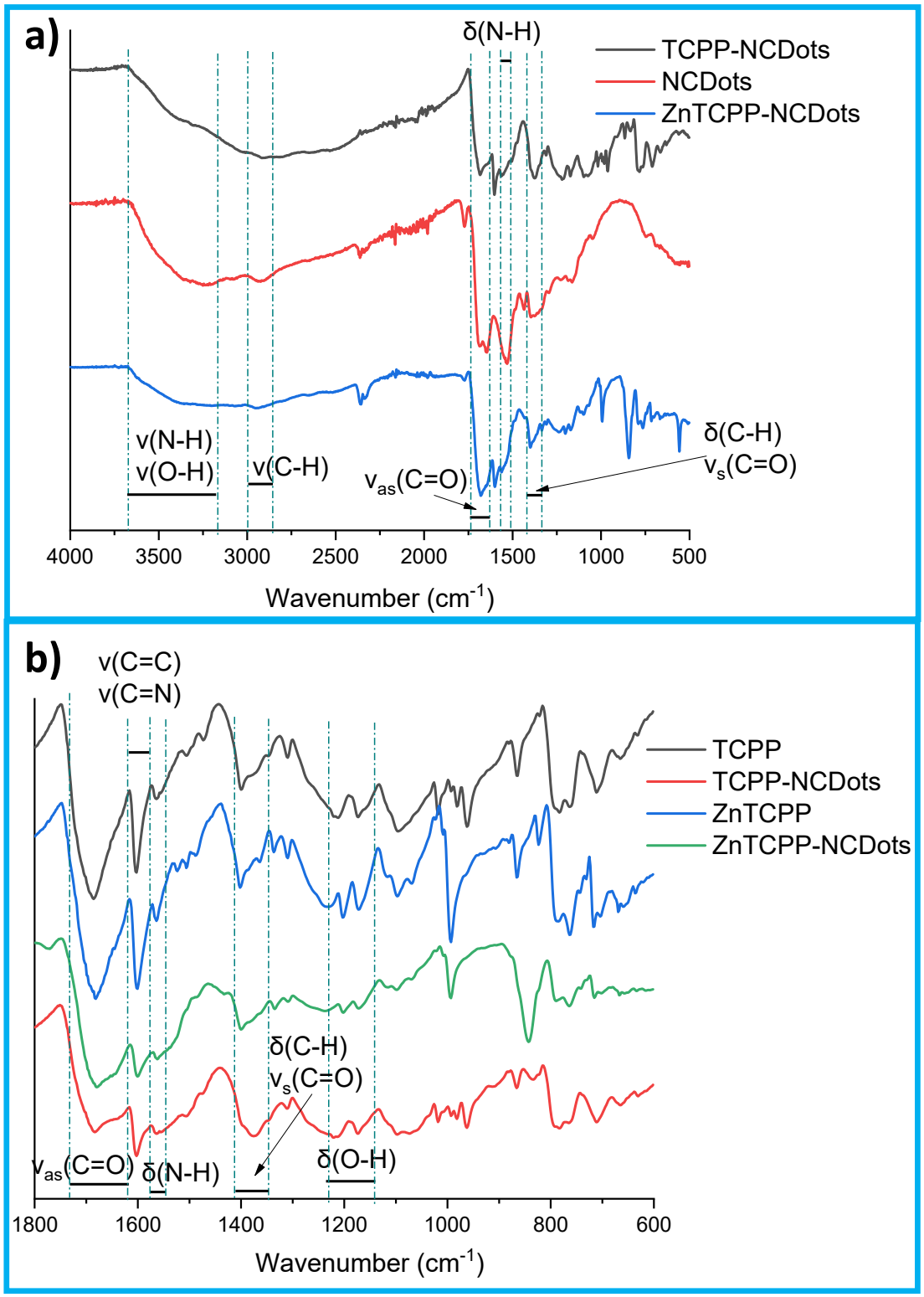

Figure S7. FT-IR spectra of **TCPP-NCDots**, **ZnTCPP-NCDots**, **NCDots** and the starting **TCPP** and **ZnTCPP** porphyrins.

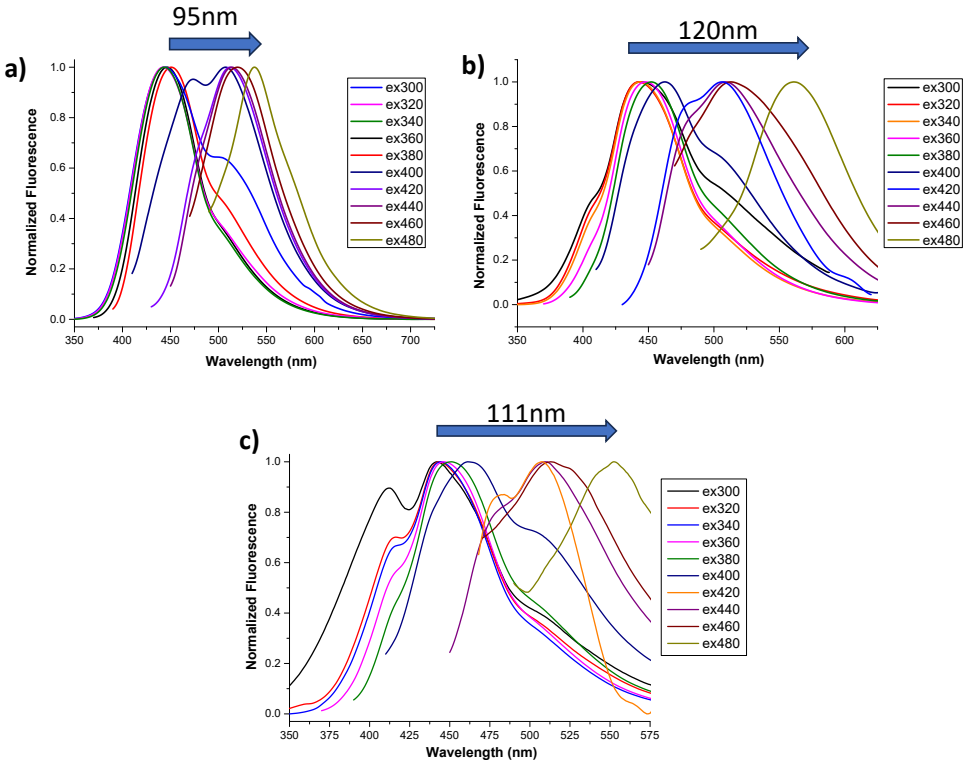

Figure S8: Normalized emission spectra in DMSO of the NCDot-originated emission band for nanomaterials a) **NCDots**, b) **TCPP-NCDots** and c) **ZnTCPP-NCDots**.

Table S2. Atomic fractions of carbon containing species.

	at%					
Sample	C-C	C-N/C-O	-C=O	-COO	π-π*	C bonded with O/N
TCPP	74.0	11.7	5.3	6.0	3.0	23.0
ZnTCPP	75.9	10.4	4.3	6.6	2.8	21.2
NCDots	51.2	31.2	16.0	1.6		48.8
TCPP-NCDots	68.4	21.2	10.5	0	0	31.6
ZnTCPP-NCDots	66.0	22.6	10.0	1.4	0	34.0

Table S3. Binding Energies of N1s and $Zn2p_{3/2}$ peaks.

	N1s (eV)	$Zn2p_{3/2}$ (eV)
TCPP	398.2 & 400.1	
ZnTCPP	398.6	1022.2
NCDots	400.1	
TCPP-NCDots	400.0	
ZnTCPP-NCDots	400.1	1021.1

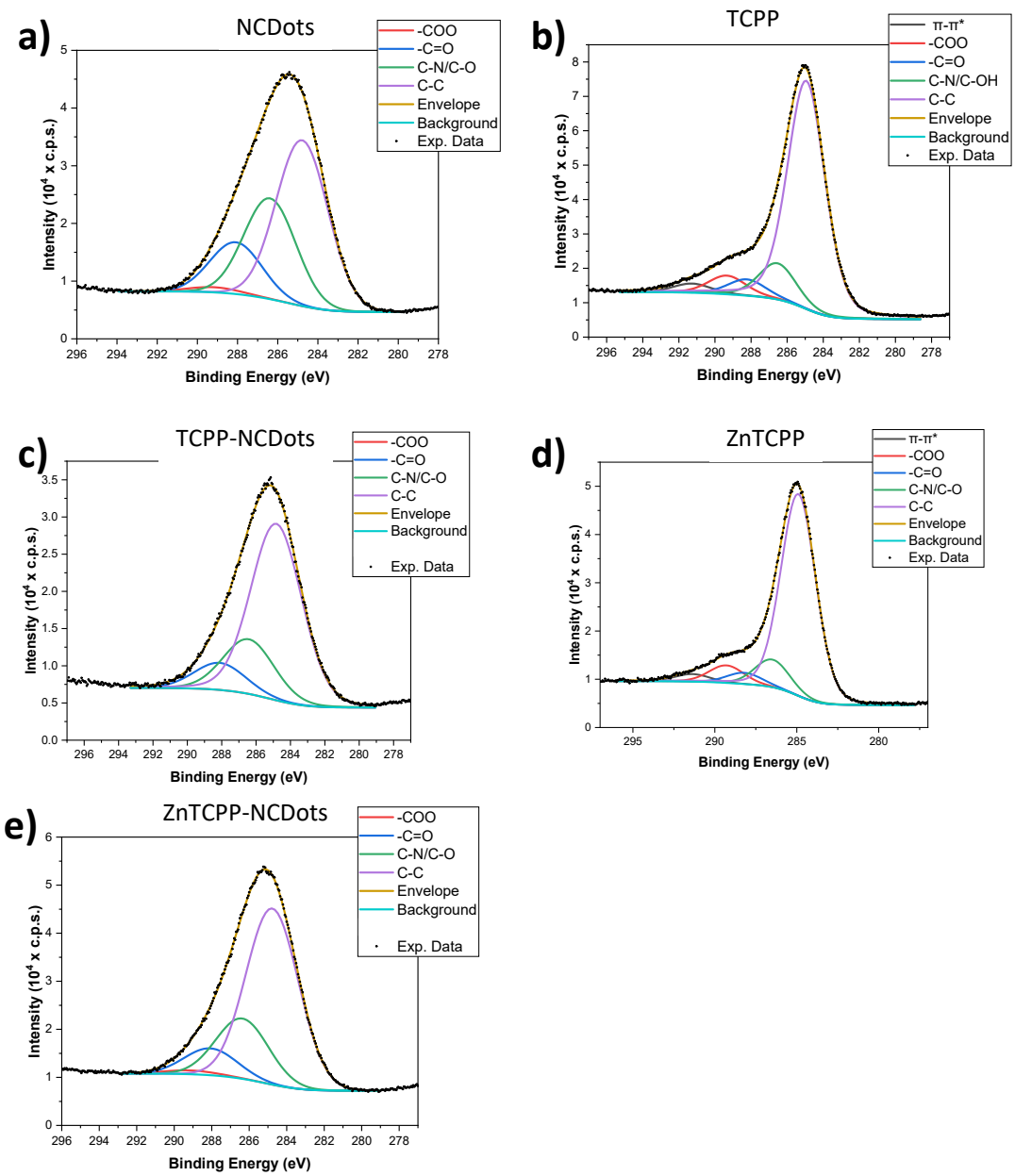

Figure S9. C1s spectra of the a) **NCDots**, b) **TCPP**, c) **TCPP-NCDots**, d) **ZnTCPP** and e) **ZnTCPP-NCDots**.

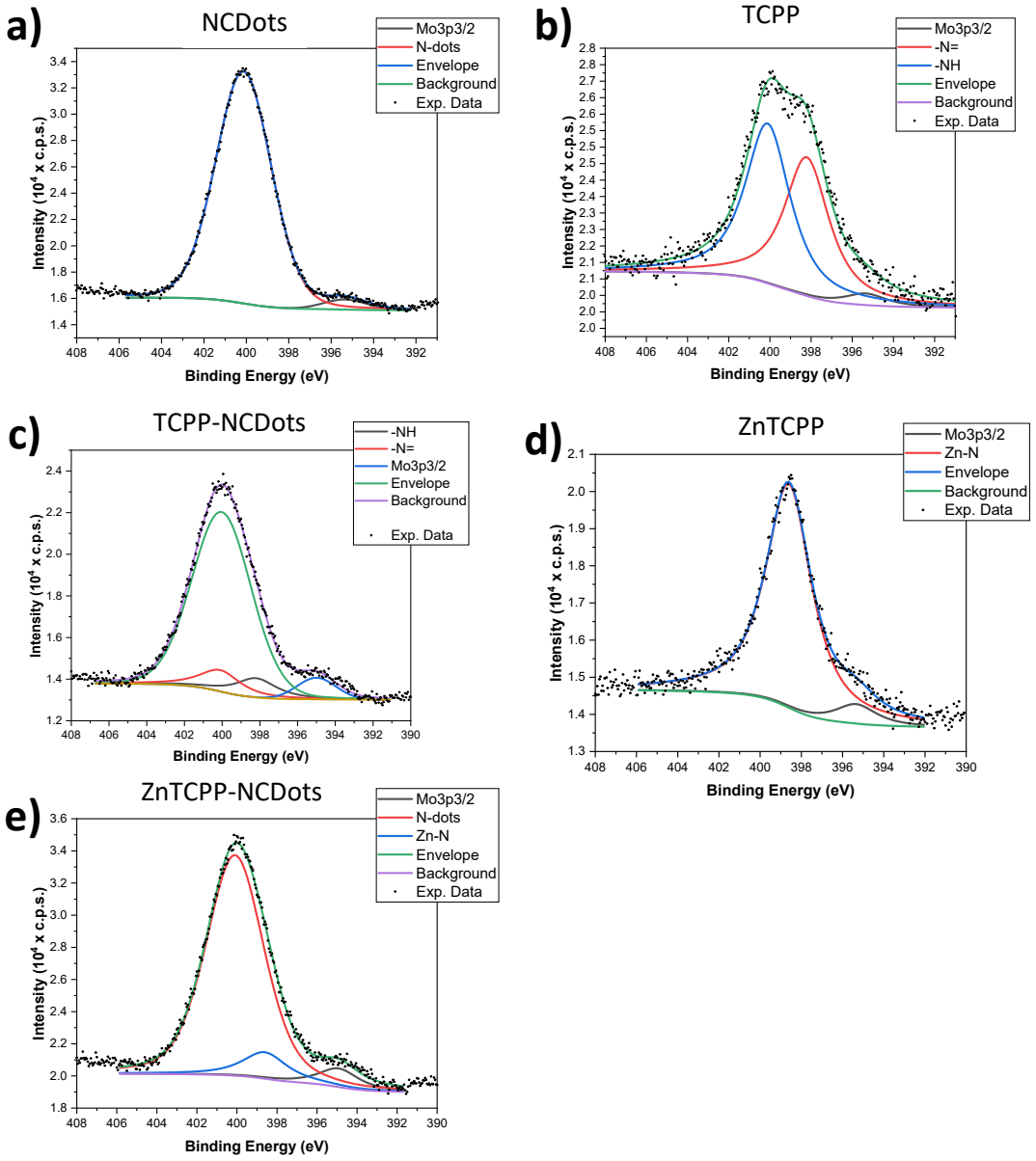

Figure S10. N1s spectra of the a) **NCDots**, b) **TCPP**, c) **TCPP-NCDots**, d) **ZnTCPP** and e) **ZnTCPP-NCDots**.

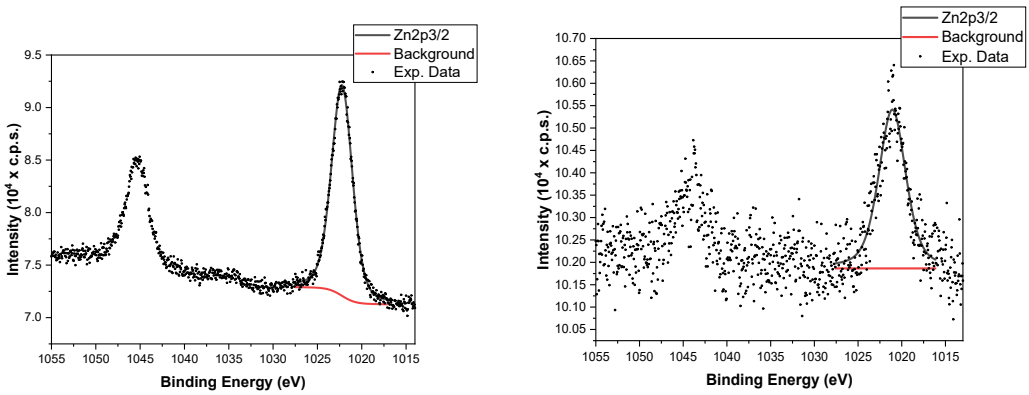

Figure S11. XPS peaks of **ZnTCPP** (left) and **ZnTCPP-NCDots** (right).

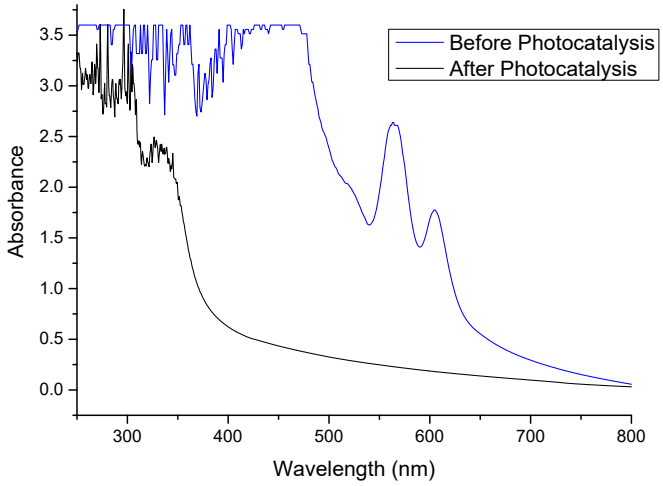

Figure S12. UV-Vis absorption spectra of the catalytic media using **ZnTCPP-NCDots** photocatalyst before and after the catalysis.

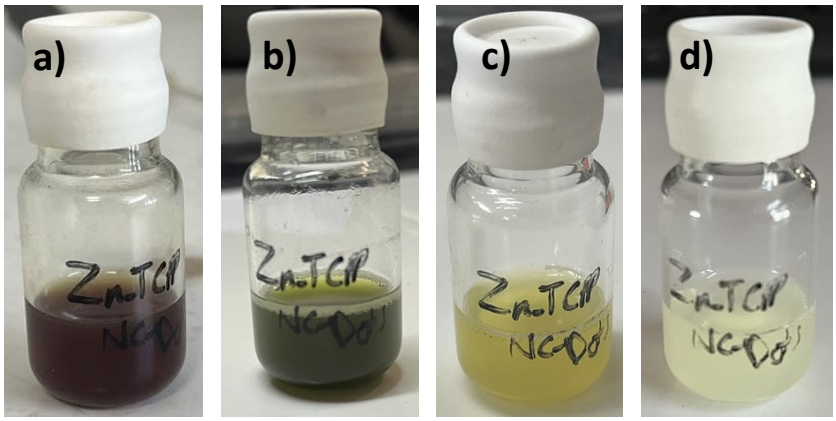

Figure S13. Photos of the catalytic media using **ZnTCPP-NCDots** photocatalyst after a) 0h, b) 24h, c) 48h and d) 72h of light irradiation.

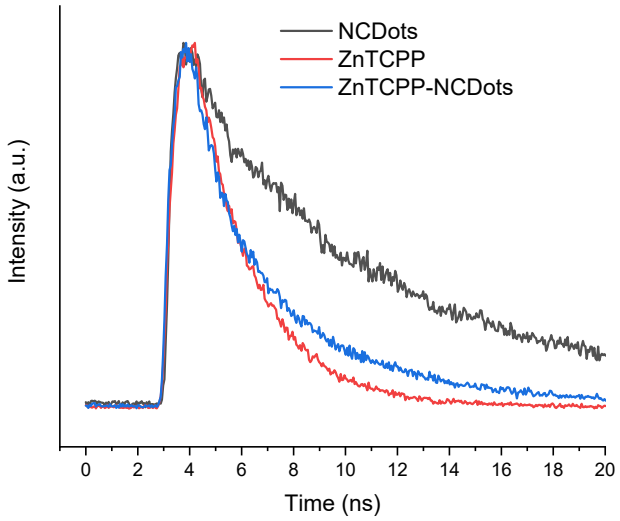

Figure S14. Histogram of lifetime fluorescence decay of **ZnTCPP**, **NCDots** and **ZnTCPP-NCDots** with a 406 nm excitation.

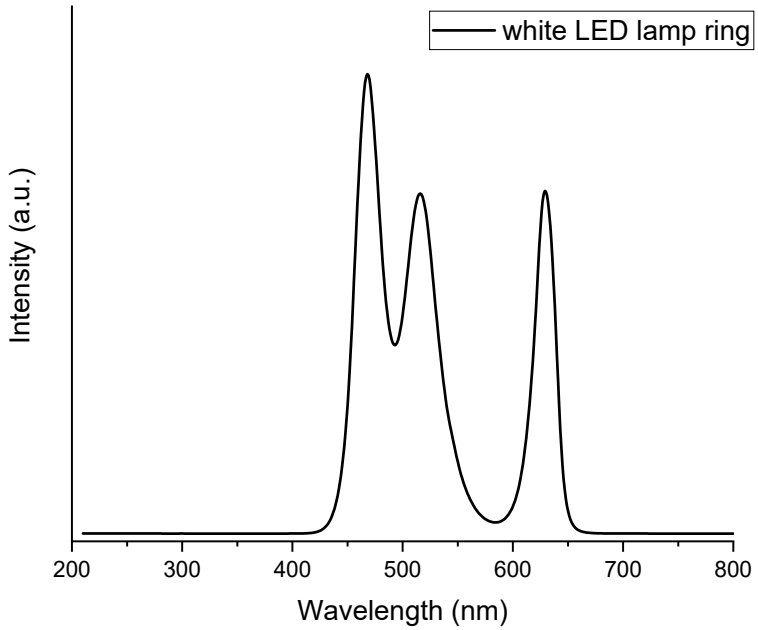

Figure S15. Spectral profile of the white LED lamp ring of 40 W with colour temperature 6400 K and lumen of 3800 LM used for the photocatalytic experiments.

Figure S16. Photo of the photoreactor used for the photocatalytic experiments.