Supplementary Information (SI) for Environmental Science: Nano.

Supporting Information

Improving photocatalytic activity and chlorine resistance performance of carbon nanolayer wrapped TiO_2 nanocomposite catalyst for dichloromethane purification

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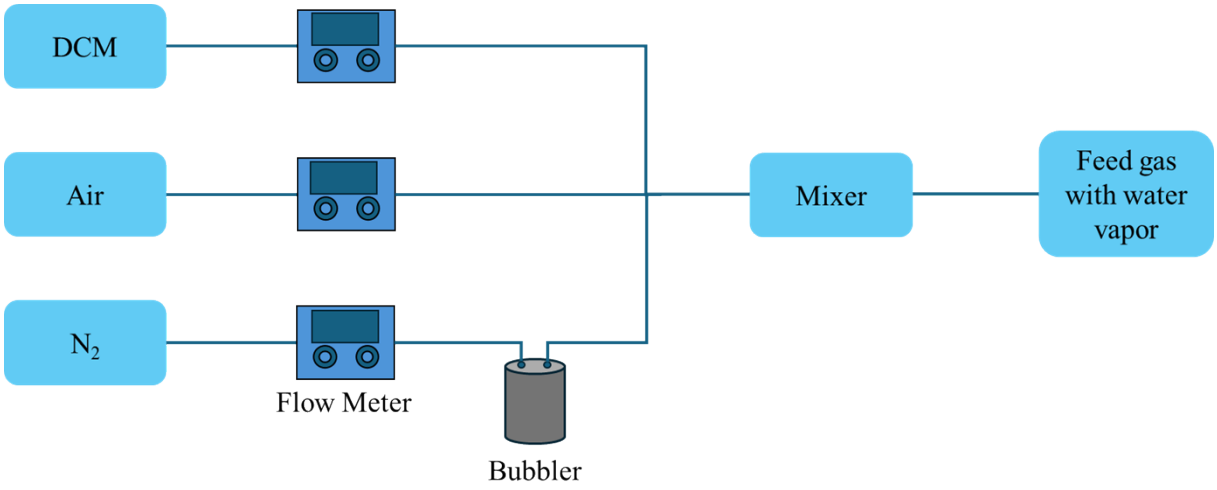

Scheme S1. Preparation diagram for the feed gas with water vapor.

For the preparation of the feed gas used in water resistance test, N_2 gas through a bubbler containing water at a certain flow rate, in which the bubbler's temperature is stabilized at 30 °C by a thermostatic water bath. Then the N_2 gas with water vapor is mixed with dry air and the standard gas of DCM diluted with N_2 to obtain the feed gas with 70 ± 1 ppmv of DCM and 10 vol % water vapor.

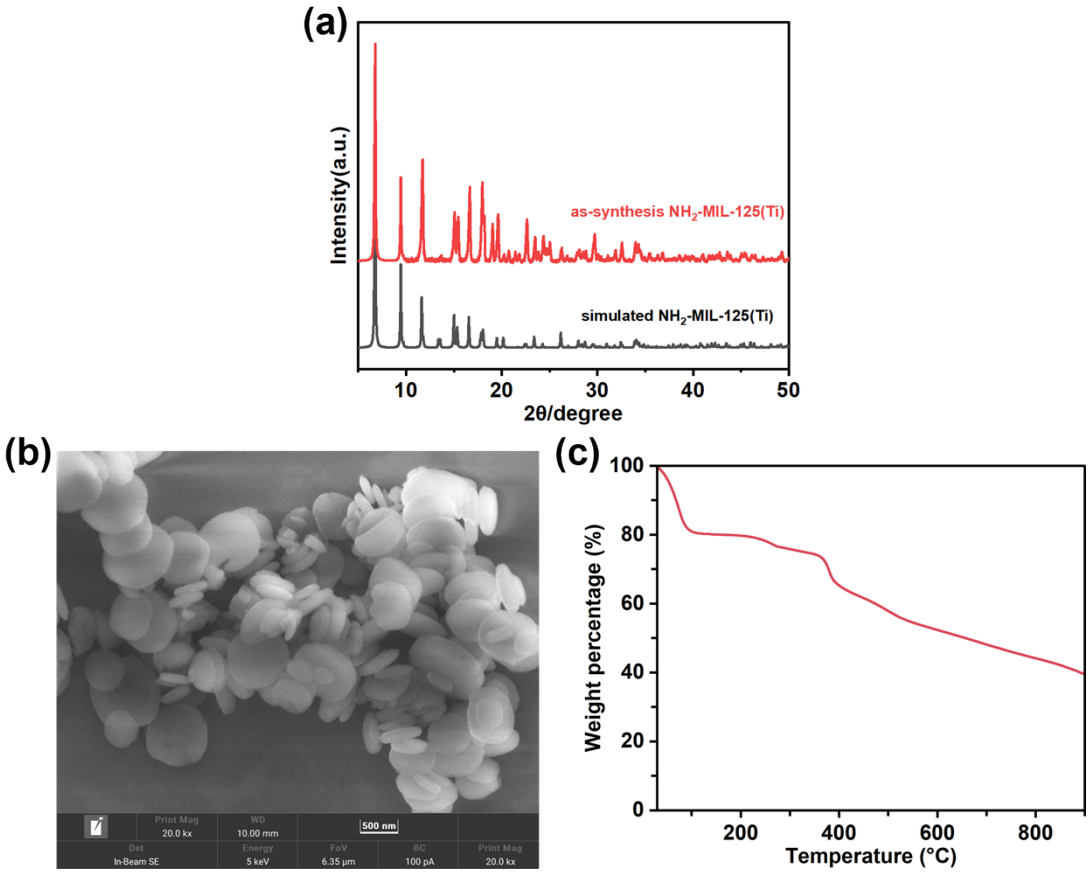

Figure S1. (a) Powder XRD patterns of the simulated and as-synthesized NH_2-MIL-125, (b) SEM image and (c) TGA spectra of as-synthesized NH_2-MIL-125.

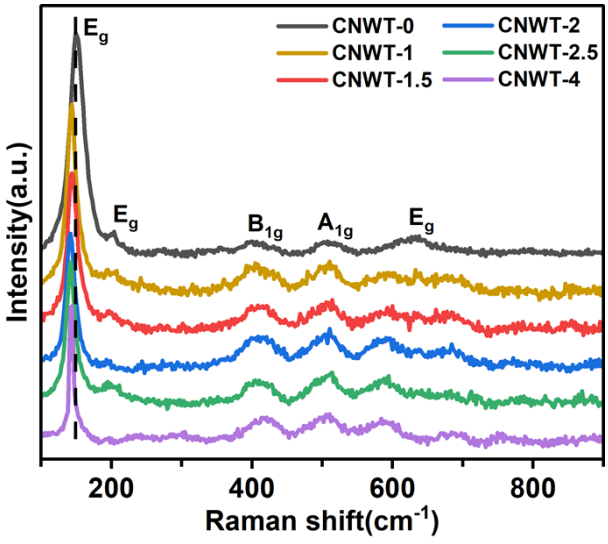

Figure S2. Raman spectra of the CNWT-0 and CNWT-x samples.

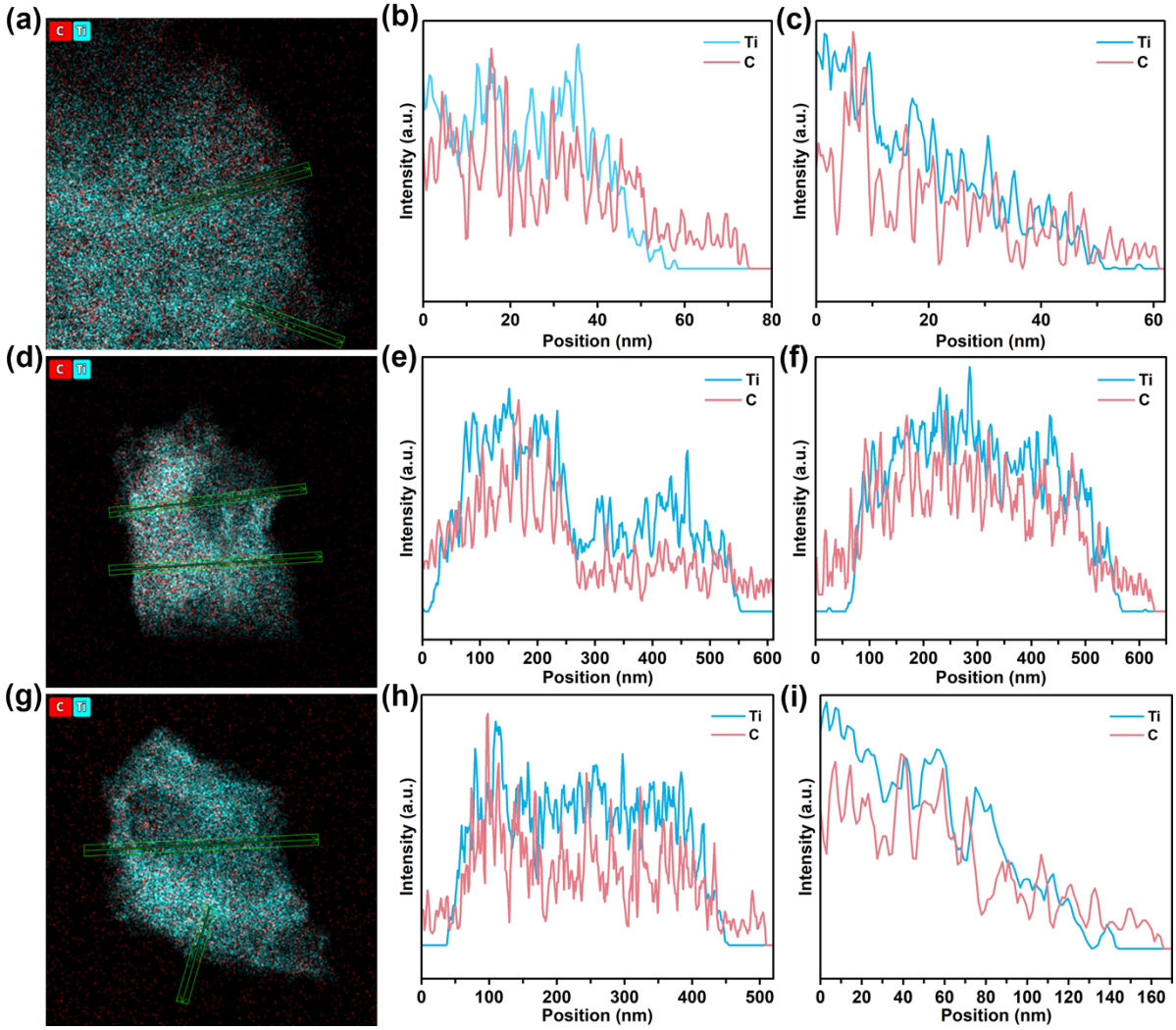

Figure S3. The elemental line scans of the CNWT-0 (a-f) and CNWT-2 (g-i) samples.

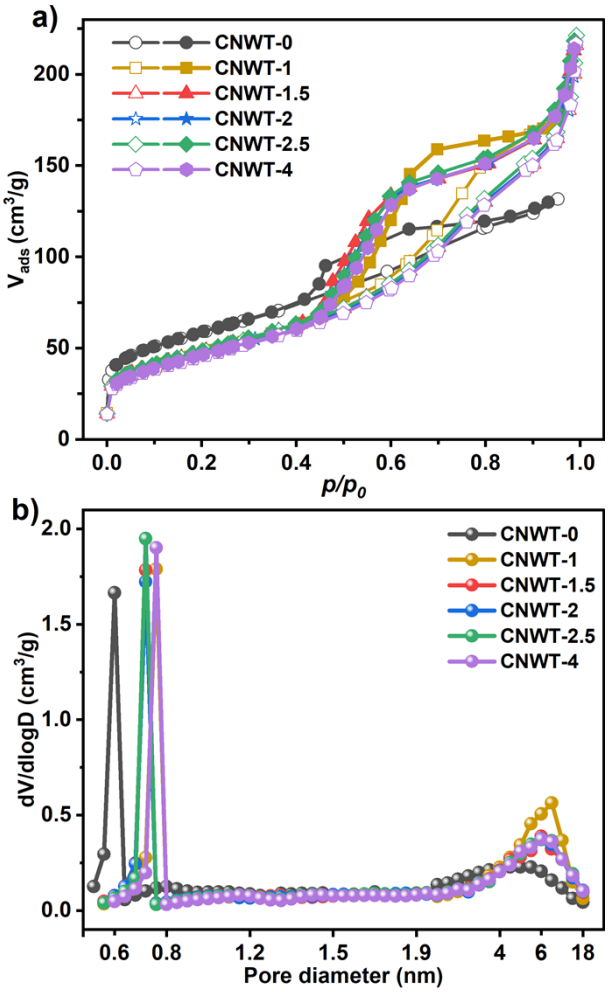

Figure S4. N_2 adsorption-desorption isotherms (a) and pore size distribution (b) of the CNWT-0 and CNWT-x samples.

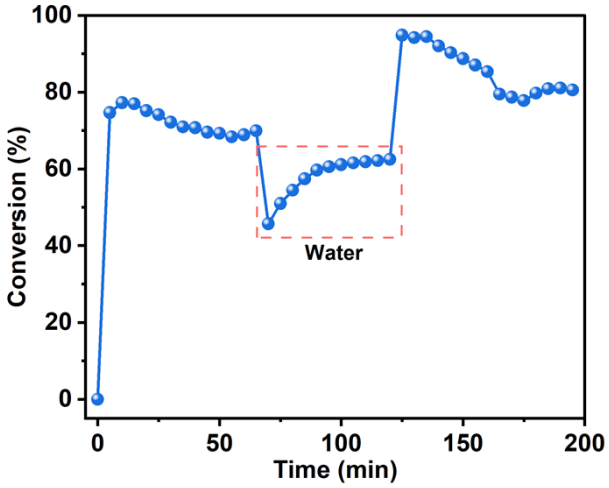

Figure S5. The DCM conversion over CNWT-2 under 10 vol % of water vapor condition.

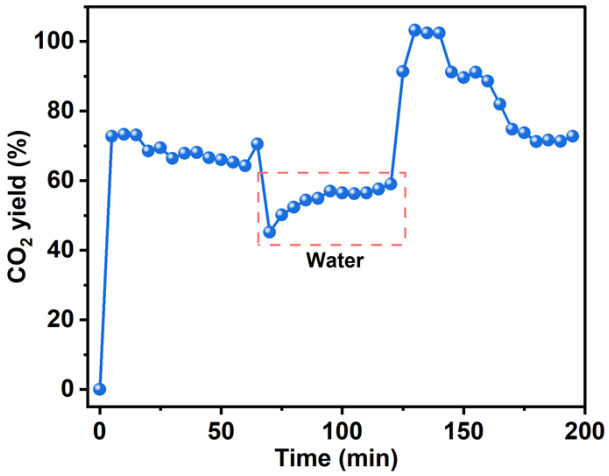

Figure S6. The CO_2 yield during the photocatalytic oxidation of DCM over CNWT-2 under 10 vol % of water vapor condition.

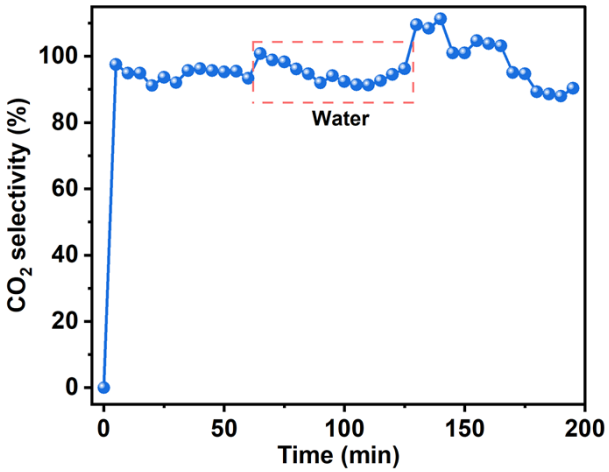

Figure S7. The CO_2 selectivity during the photocatalytic oxidation of DCM over CNWT-2 under 10 vol % of water vapor condition.

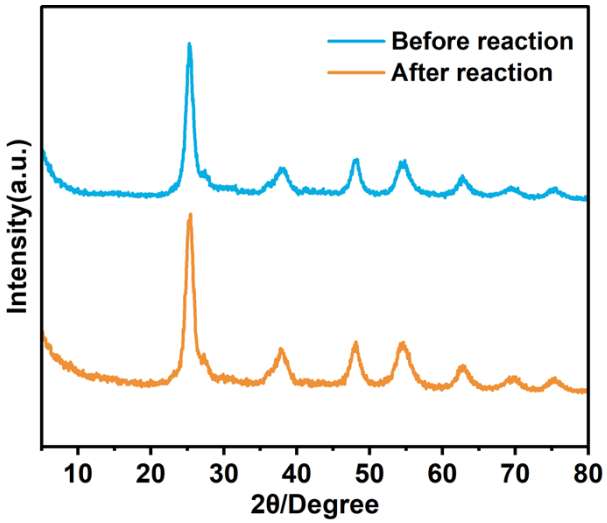

Figure S8. XRD patterns of the CNWT-2 sample before and after the catalytic reaction.

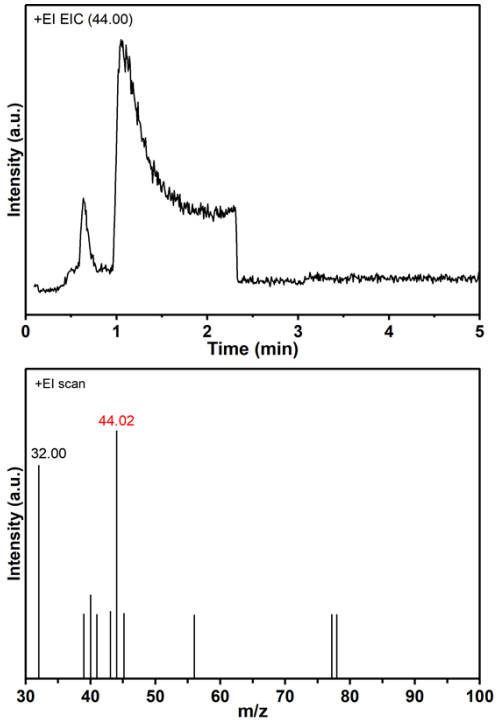

Figure S9. GC-MS spectra of CO_2 in the exit gas.

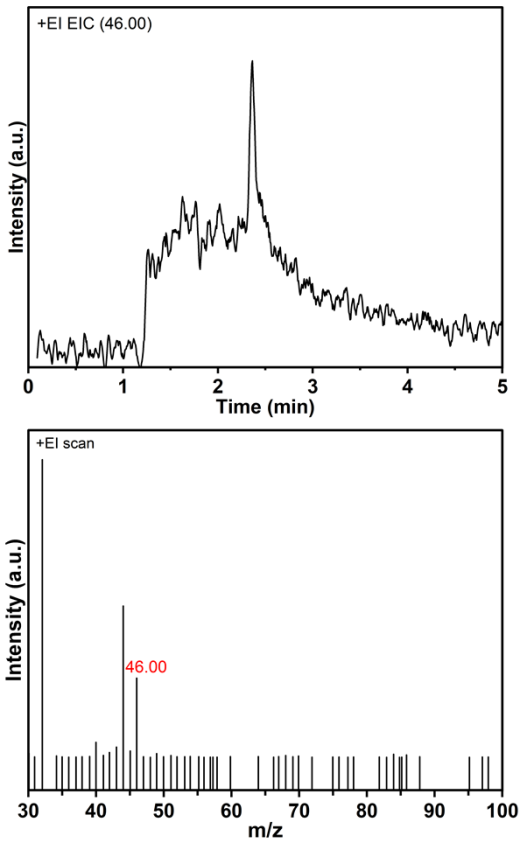

Figure S10. GC-MS spectra of HCOOH in the exit gas.

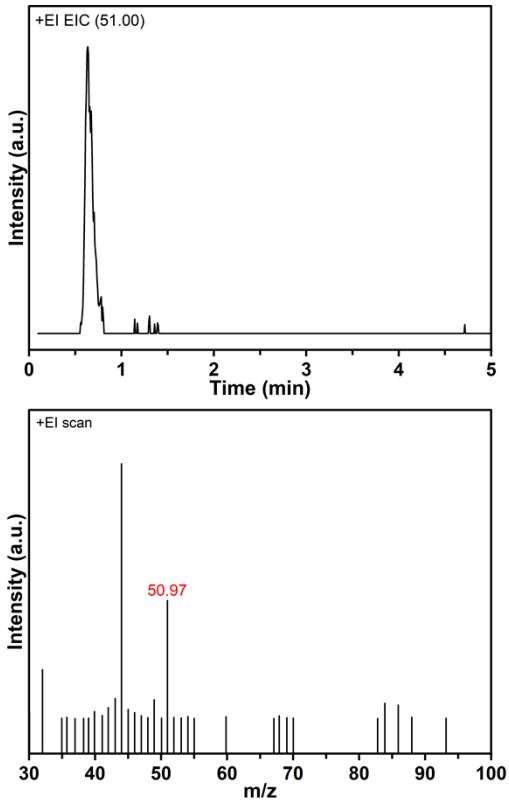

Figure S11. GC-MS spectra of CH_3Cl in the exit gas.

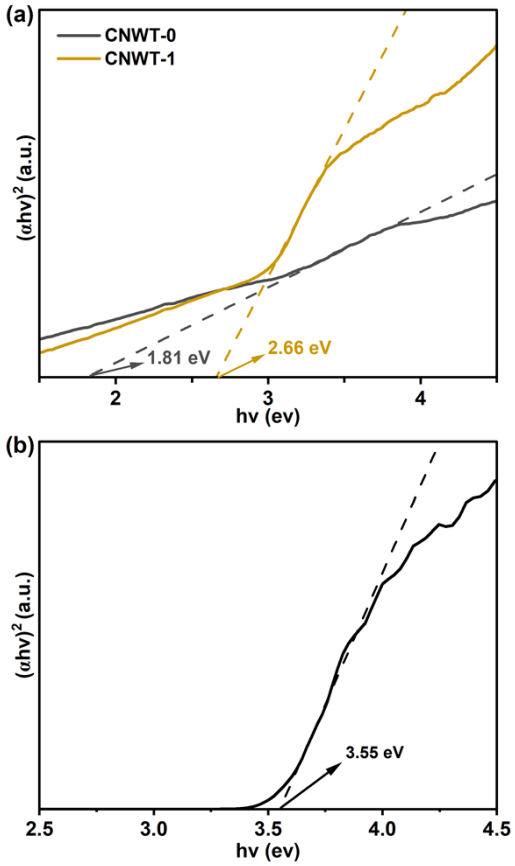

Figure S12. Band gap spectra of CNWT-0, CNWT-1 samples(a) and commercial P25 TiO_2 (b).

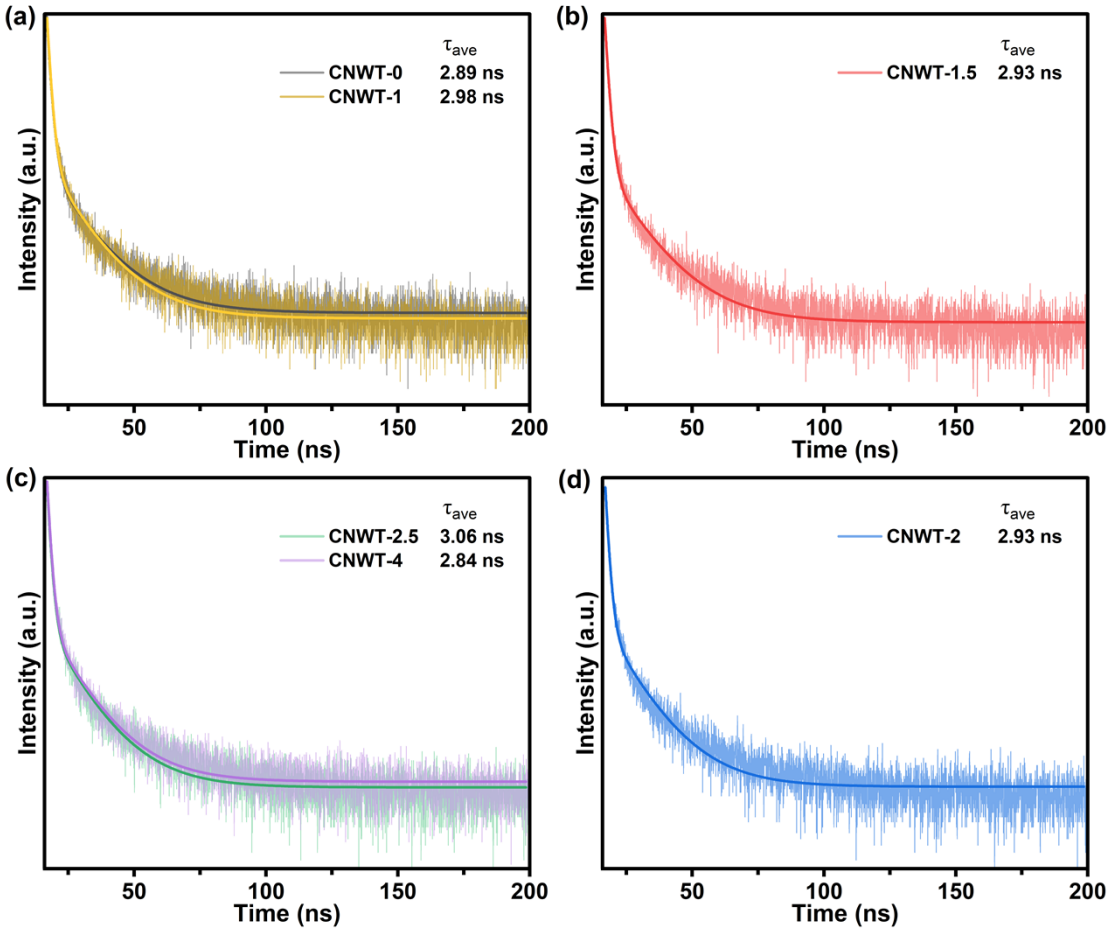

Figure S13. Time-resolved photoluminescence spectra of the CNWT-0 and CNWT-x samples.

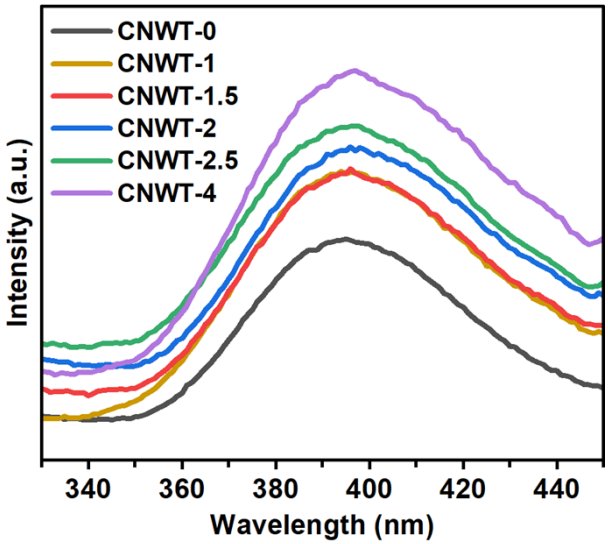

Figure S14. Steady-state fluorescence spectra of the CNWT-0 and CNWT-x samples.

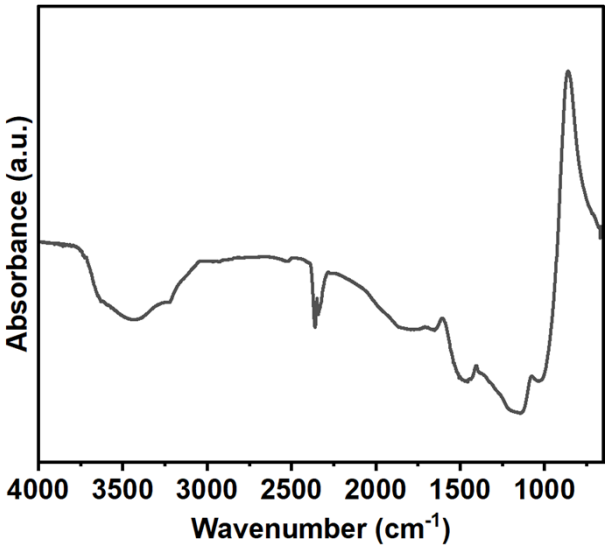

Figure S15. IR spectra of CNWT-2.

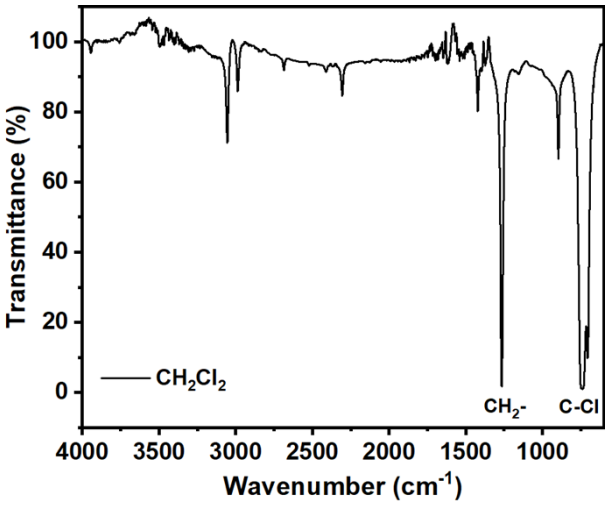

Figure S16. IR spectra of CH_2Cl_2.

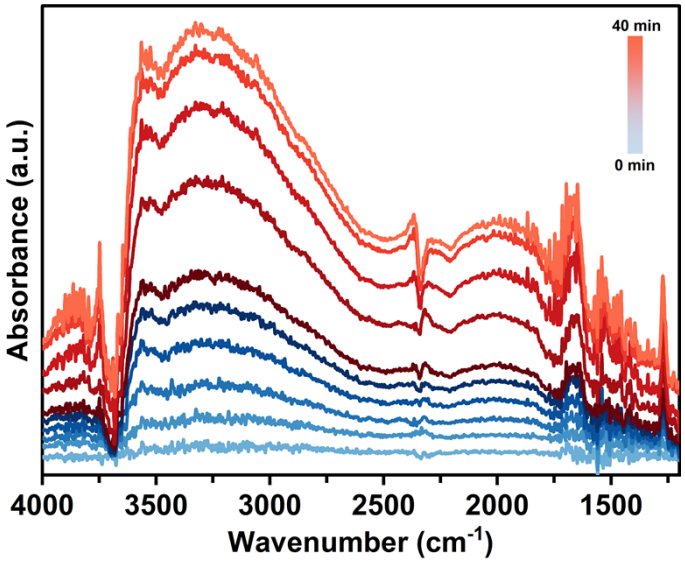

Figure S17. *In-situ* DRIFTS spectra of DCM adsorbed onto the CNWT-2 sample in the 4000-1200 cm^{-1} range.

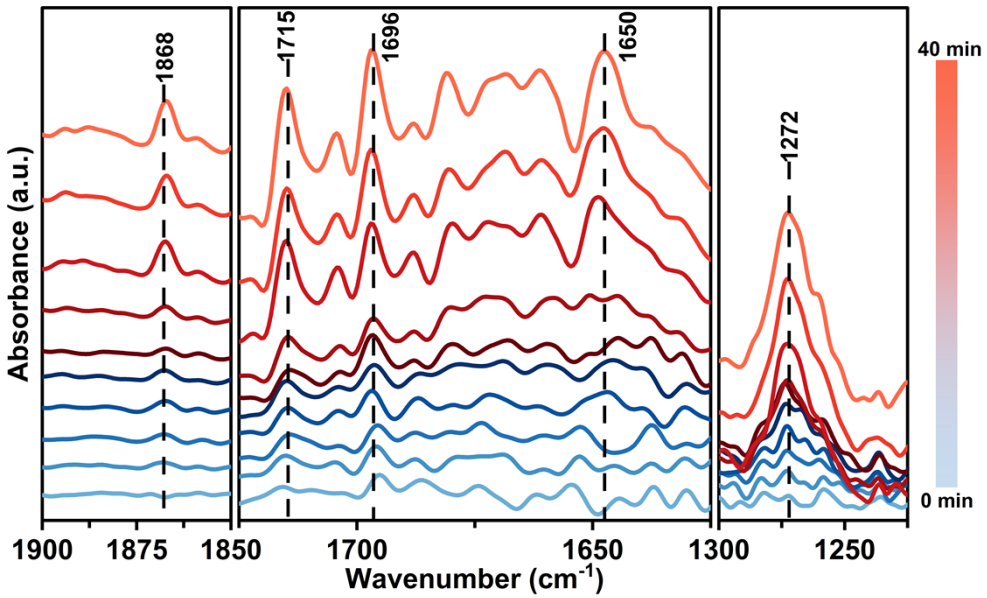

Figure S18. *In-situ* DRIFTS spectra of DCM adsorbed onto the CNWT-2 sample in the 1900-1200cm^{-1} range.

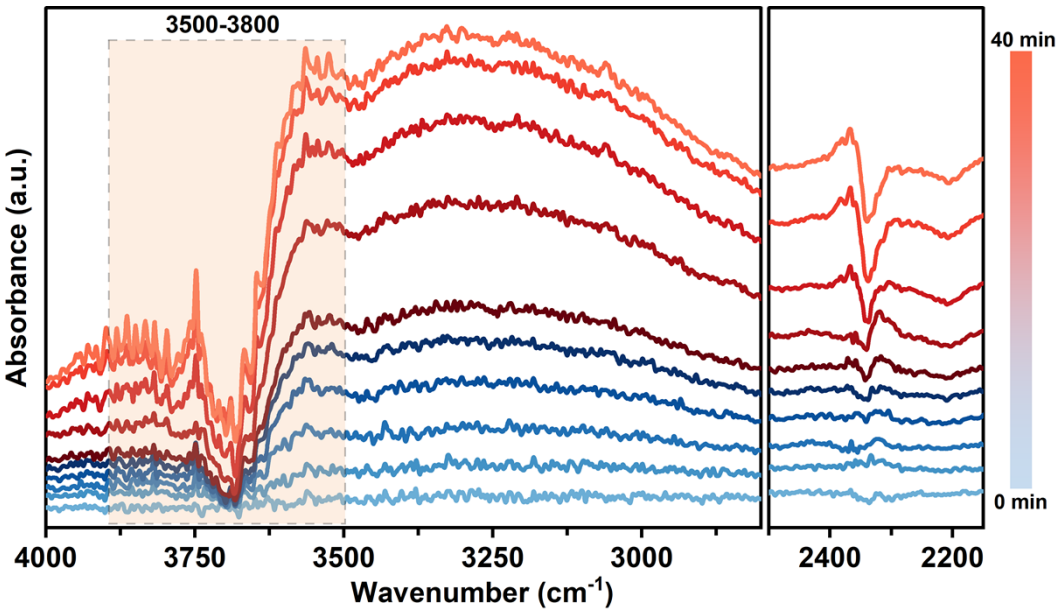

Figure S19. *In-situ* DRIFTS spectra of DCM adsorbed onto the CNWT-2 sample in the 4000-2100 cm^{-1} range.

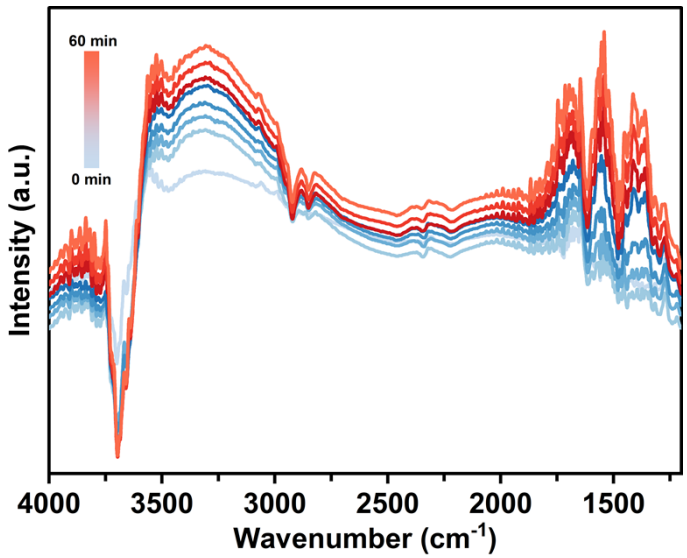

Figure S20. *In-situ* DRIFTS spectra of DCM photocatalytic oxidation as a function of time over CNWT-2 under UV-vis light irradiation.

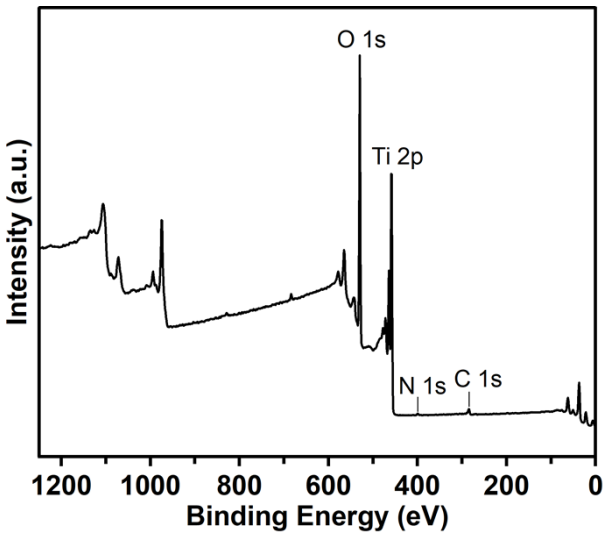

Figure S21. The *in-situ* NAP XPS survey spectra of the fresh CNWT-2 sample.

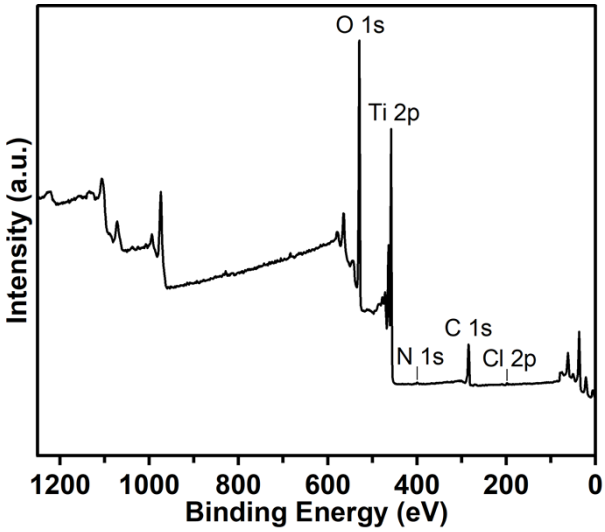

Figure S22. The *in-situ* NAP XPS survey spectra of CNWT-2 in air-balanced DCM conditions without light irradiation.

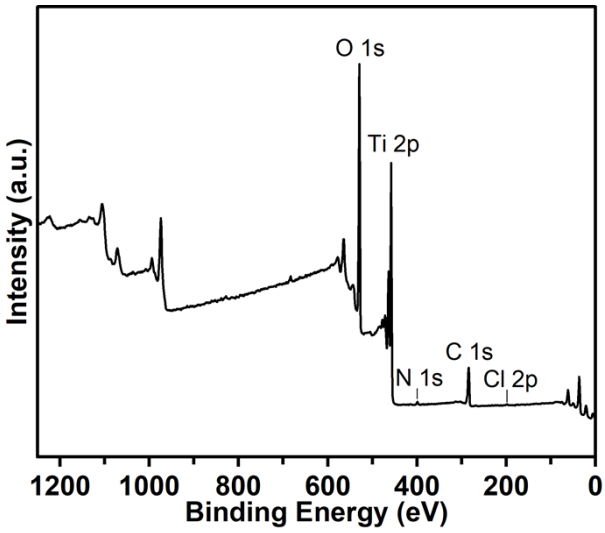

Figure S23. The *in-situ* NAP XPS survey spectra of CNWT-2 in air-balanced DCM conditions under UV-vis light irradiation.

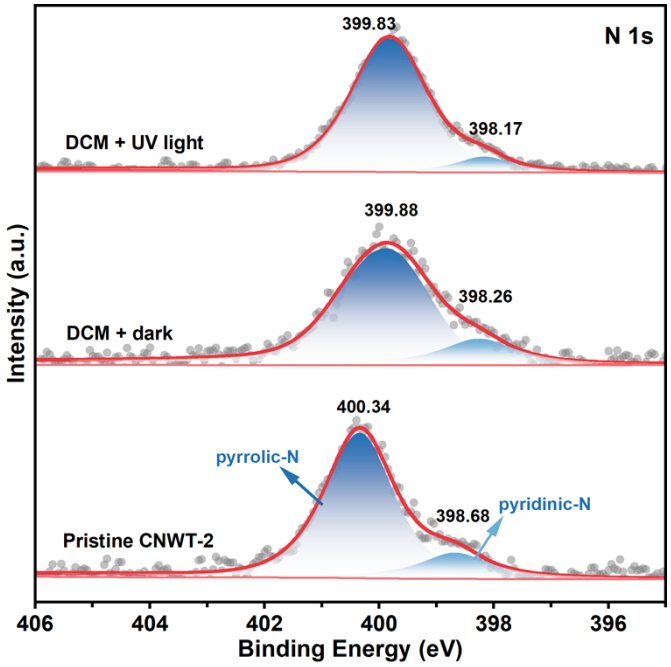

Figure S24. *In-situ* NAP XPS spectra of N 1s for the CNWT-2 sample.

Table S1. The relative ratio of D band to G band (I_D/I_G) and the carbon content of CNWT-0 and CNWT-x samples.

Sample	CNWT-0	CNWT-1	CNWT-1.5	CNWT-2	CNWT-2.5	CNWT-4
I_D/I_G	0.85	0.83	0.87	0.85	1.05	1.01
C (%)	42.33	32.45	29.03	23.07	18.12	16.08

Table S2. The specific surface area and porosity of the CNWT-0 and CNWT-x samples.

Sample	S_{BET} (m^2/g)	V_p (cm^3/g)	D_p (nm)
CNWT-0	204.47	0.20	3.98
CNWT-1	170.1	0.27	6.28
CNWT-1.5	171.97	0.33	7.60
CNWT-2	170.43	0.33	7.71
CNWT-2.5	171.91	0.33	7.63
CNWT-4	163.91	0.32	7.95

Table S3. Fitting parameters for Time-resolved photoluminescence of the CNWT-0 and CNWT-x samples.

Sample	A_1	τ_1	A_2	τ_2	τ_{ave}
CNWT-0	40813.55	1.57	0.39	16.38	2.89
CNWT-1	60617.12	1.52	0.45	15.71	2.98
CNWT-1.5	35807.81	1.58	0.38	16.57	2.93
CNWT-2	0.46	15.26	134192.80	1.42	2.93
CNWT-2.5	0.47	15.00	106546.00	1.44	3.06
CNWT-4	0.47	15.21	95174.71	1.46	2.84