Supplementary Information (SI)

for

One-step synthesis of carbon nitride nanobelts for enhanced photocatalytic degradation of organic pollutants through peroxydisulfate activation.

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Text S1. Sample characterization

The morphologies and microstructures of the obtained photocatalysts were elucidated using scanning electron microscopy (SEM, Hitachi, SU8220) and transmission electron microscopy (TEM, Thermo, FEI, Talos F200S). The distribution of elements in the as-prepared samples was examined using energy dispersive spectroscopy (EDS) connected to the TEM. The thickness of catalyst was determined by Atomic force microscopy(AFM). The crystal phases of the samples were characterized by powder X-ray diffraction (XRD, D8 Rigaku9000) with Cu K radiation. The specific surface areas of the prepared samples were quantified on a Micrometrics ASAP 2460 instrument at 77K. Fourier transform infrared (FTIR) measurements were recorded using a Thermo Fisher Scientific Nicolet 6700 spectrometer with samples dispersed in KBr. X-ray photoelectron spectroscopy (XPS) were collected with an Escalab 250Xi (Thermo Fisher Scientific) instrument under Al K radiation. The Uv-vis diffuse reflectance spectra (DRS) of the as-prepared samples was obtained with a Shimadzu UV-2550 UV-vis spectrophotometer. The photoluminescence (PL) spectra were measured using a FluoroMax-4 fluorescence spectrophotometer (HORIBA Jobin Yvon) with an excitation of 300 nm. Time-resolved fluorescence decay spectra were obtained by a FLS980 Fluorescence Spectrometer (Edinburgh Instruments).

Text S2. Determination of concentration of SMT.

The concentrations of SMT were determined by an HPLC system that consisted of two Shimadzu LC-20AD pumps (Shimadzu, Japan) and a Shimadzu SPD-M20A photodiode array detector. The HPLC system was equipped with a Zorbax Eclipse XDB-C18 (4.6 x 150 mm, 5μm). The chromatographic conditions of IDM were as follows column: mobile phase: methanol/ formic acid buffer solution (30:70 v/v containing 0.2 % formic acid); flow rates: 1 mL/min; injection volume: 20μL; temperature: 35°C; detection wavelength: 262 nm.

Text S3. Identification of photocatalytic by-products of SMT.

The photocatalytic degradation intermediates of SMT were identified by HRLC-MS-MS (Thermo Scientific Ultimate 3000 RSLC and Q Exactive Orbitrap). Separation was accomplished using an Hypersil GOLD C18 (100 x 2.1 mm, 1.9 μm) with column temperature 40 ℃. Elution was performed at a flow rate of 0.3 mL/min with water that contained 0.1 % (v/v) formic acid as eluent A, and methanol as eluent B. Mass spectral analysis was conducted in both positive and negative mode.

Text S4. Electrochemical measurements

Photoelectrochemical measurements were analyzed using a CHI-660 electrochemical system (Shanghai, China), which was equipped with a conventional three-electrode electrochemical cell. The as-prepared catalysts on ITO served as the working electrode, while a saturated calomel electrode (SCE) and platinum (Pt) wire were employed as the reference electrode and the counter electrode, respectively. A 450 nm LED lamp (3 x 3 W, Shenzhen lamplic co., LTD, China) was used for illumination. The photocurrent was recorded in a 0.1 M sodium sulfate solution (Na_2SO_4).

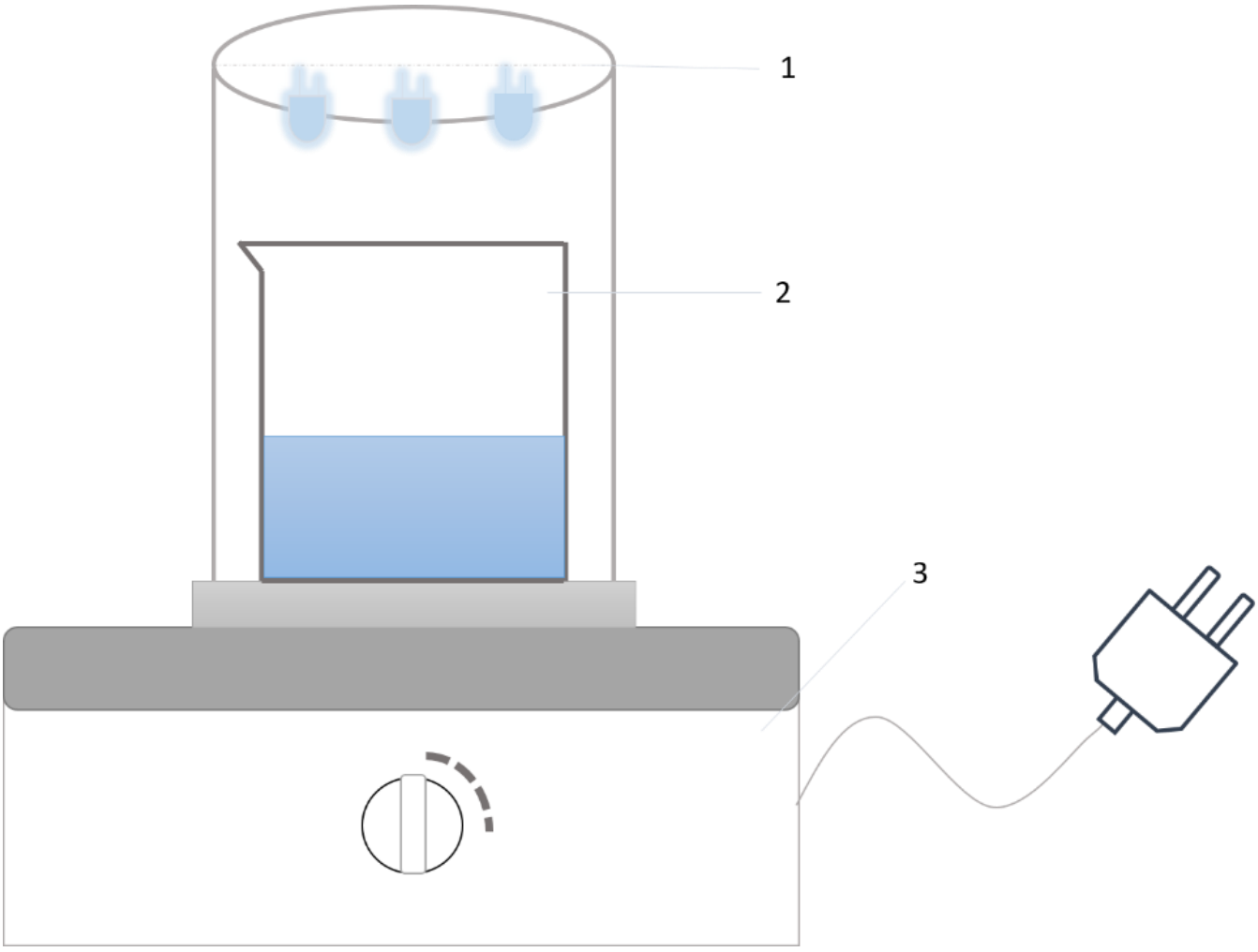


Fig. S1. Irradiation of the homemade photocatalytic reactor system: 1 = blue LED lamps, 2 = quartz breaker reaction vessel, 3 = magnetic stirrer [1].

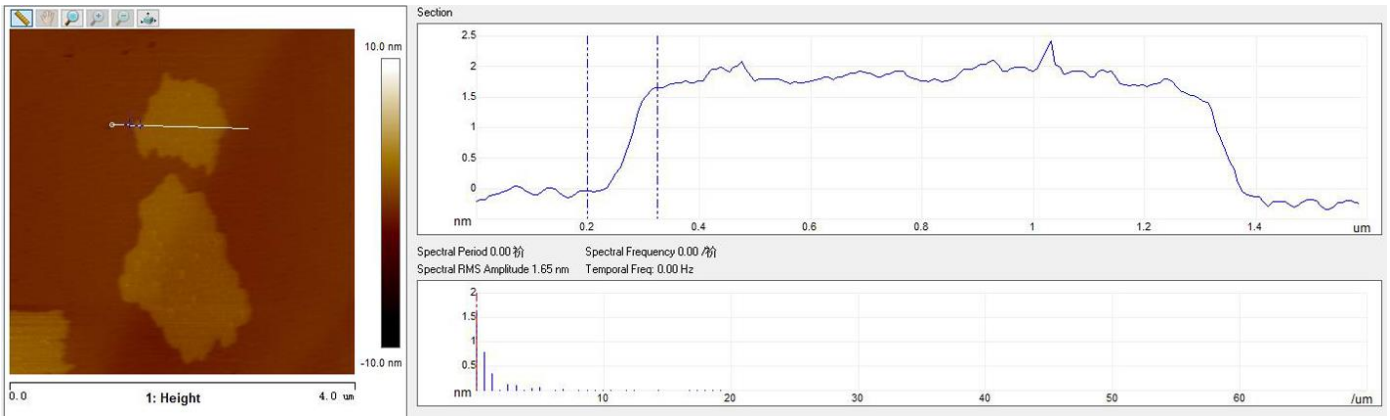


Fig. S2. AFM image and the height distribution profile of CNNB.

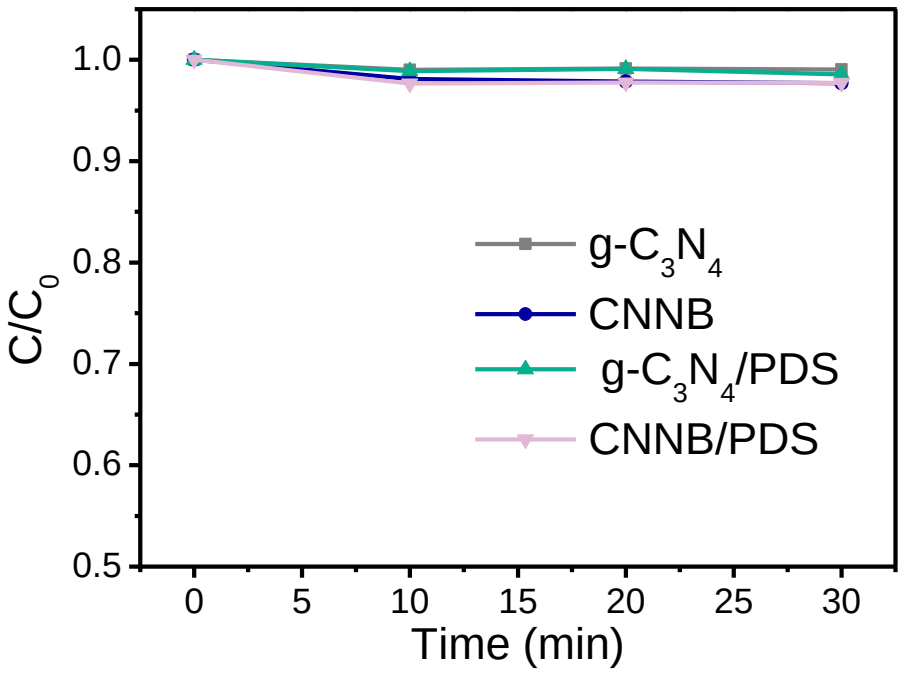


Fig. S3. The adsorption for SMT of the samples in the darkness.

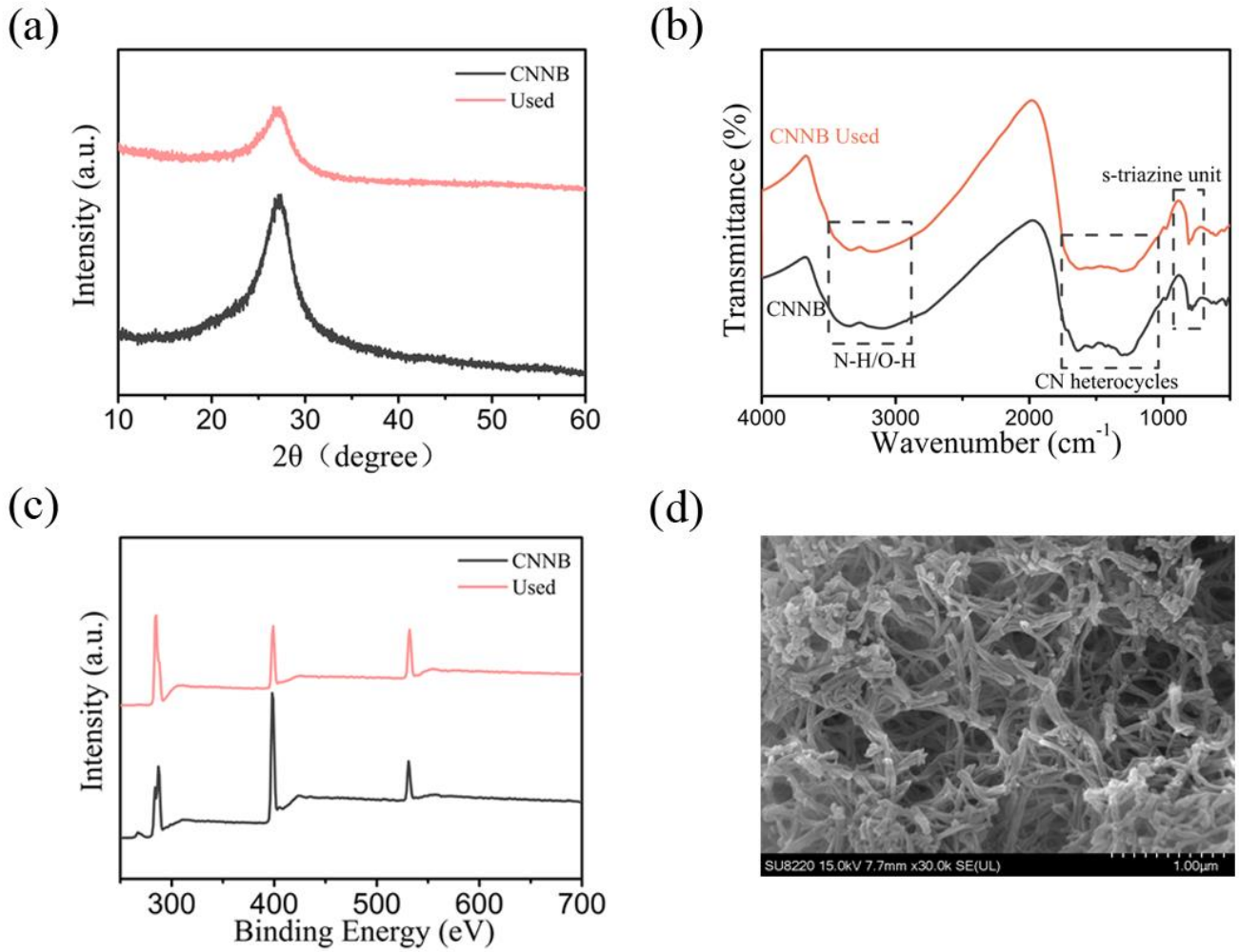


Fig. S4. (a) XRD pattern, (b) FTIR spectra, (c) XPS spectra and (d) SEM of CNNB prior to and following repeated photocatalytic degradation experiments

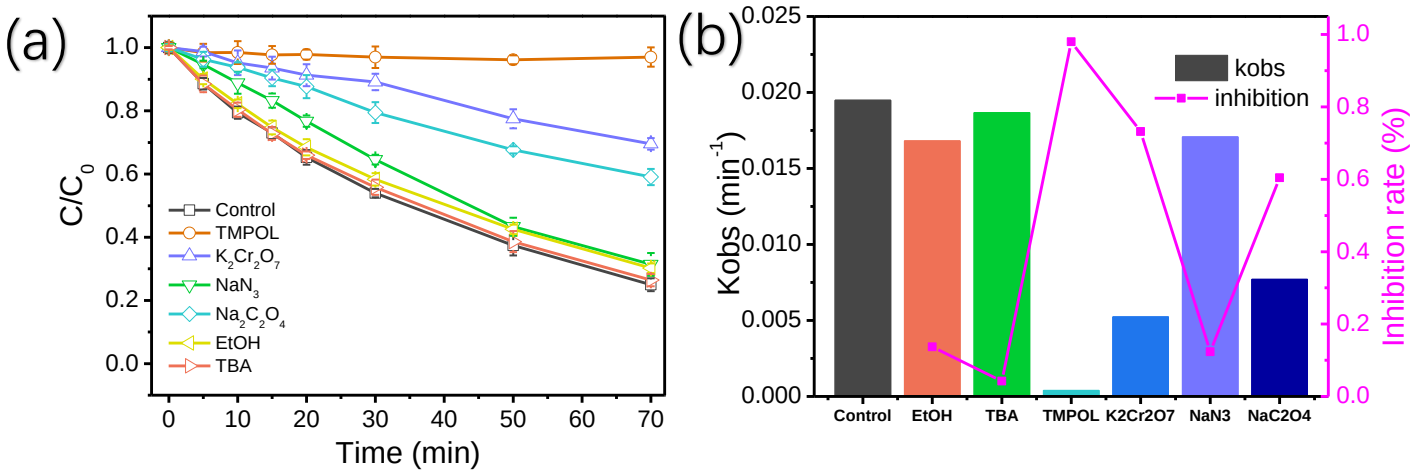


Fig. S5. (a) The degradation of SMT in the presence of different scavengers and (b) the corresponding degradation kinetic constants of SMT (bar, left y-axis) and the inhibition rate of RSs (pink curve, right y-axis) in the CNNB/blue-LED system.

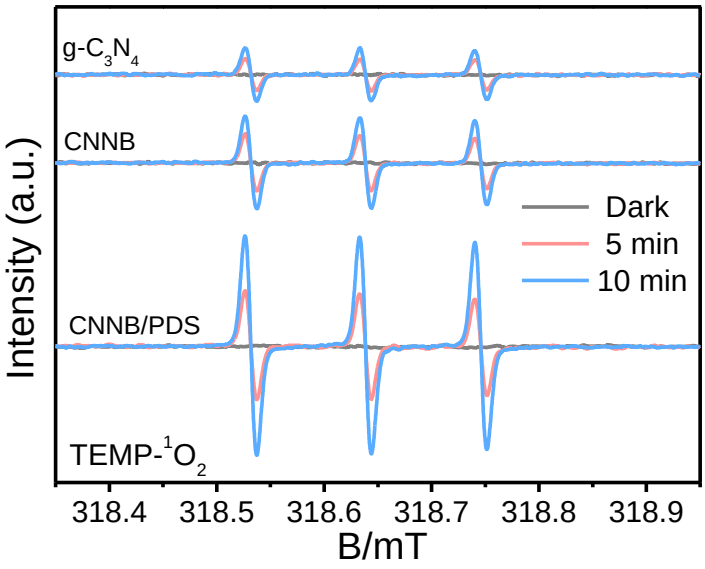
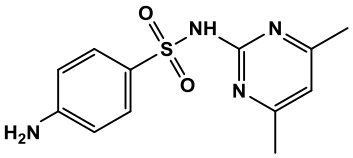
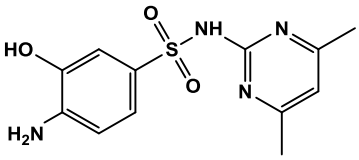
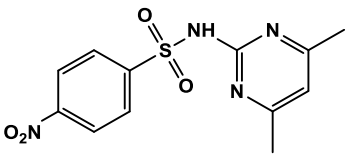
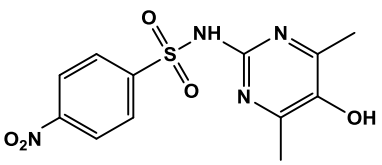


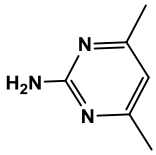
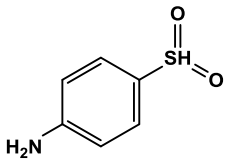
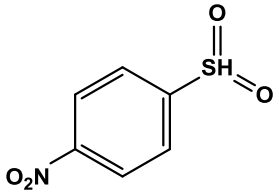
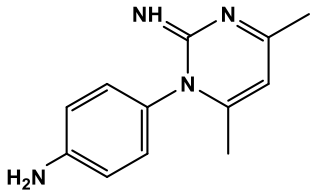
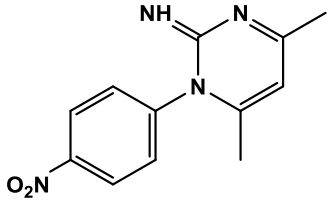
Fig. S6. ESR spectra of the TEMP-$^1O_2$ adducts, recorded with the different conditions under dark and blue-LED light irradiation.

Table S1: Fluorescence decay parameters of g-C_3N_4 or CNNB fit of the decay

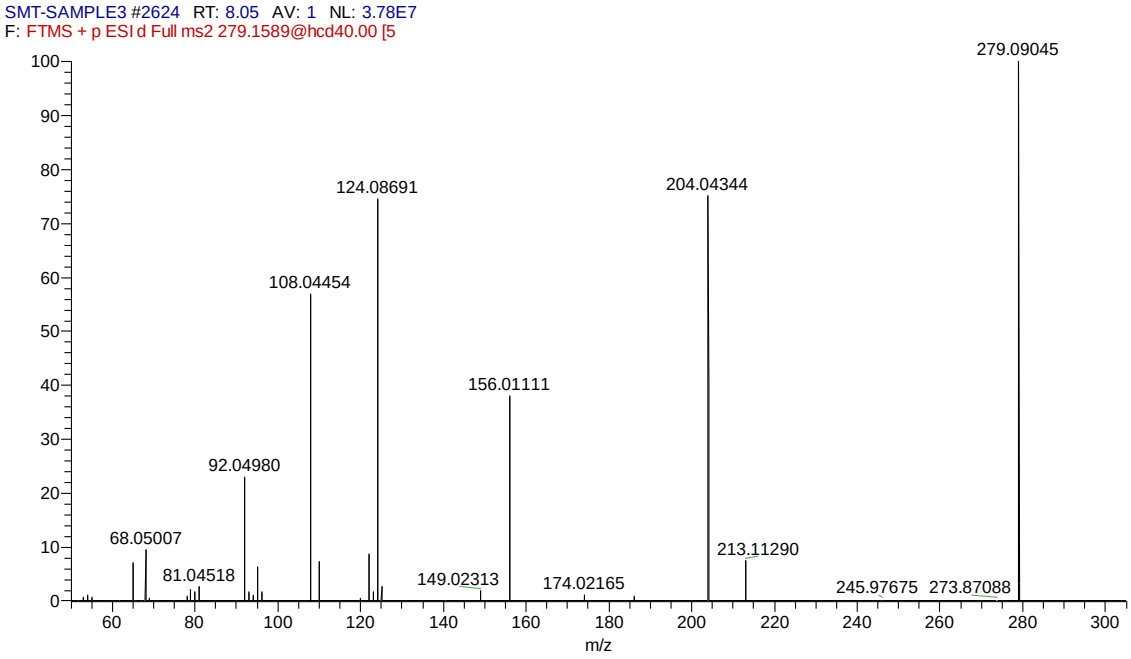
Sample	τ1	τ2	τ3	B_1	B_2	B_3	X^2	Average Lifetime(τ)/ns
g-C_3N_4	0.3857	1.8627	6.5758	0.019(11.23%)	0.015(44.26%)	0.004(44.52%)	1.011	3.7003
CNNB	0.2477	1.4402	4.9358	0.038(19.75%)	0.016(47.42%)	0.003(32.83%)	1.145	2.2979

Table S2: Compounds (SMT-A-H) identified by HPLC/MS/MS during the photocatalytic degradation of SMT under blue-light irradiation.

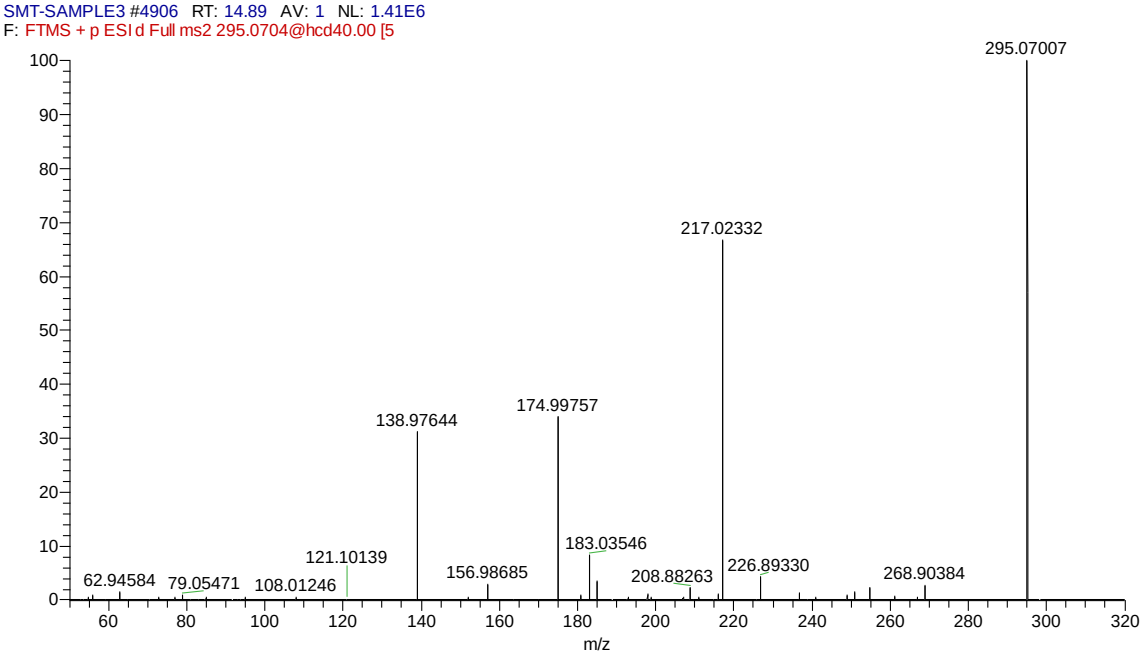
Number	Rt/min	m/z	Molecular formula	Probable structure
SMT	8.05	278	$C_{12}H_{14}N_4O_2S$	
A	14.89	294	$C_{12}H_{14}N_4O_3S$	
B	10.49	308	$C_{12}H_{12}N_4O_4S$	
C	17.66	324	$C_{12}H_{12}N_4O_5S$	

D	2.41	123	$C_6H_9N_3$	
E	3.55	157	$C_6H_7NO_2S$	
F	11.17	187	$C_6H_5NO_4S$	
G	3.74	214	$C_{12}H_{14}N_4$	
H	12.41	244	$C_{12}H_{12}N_4O_2$	

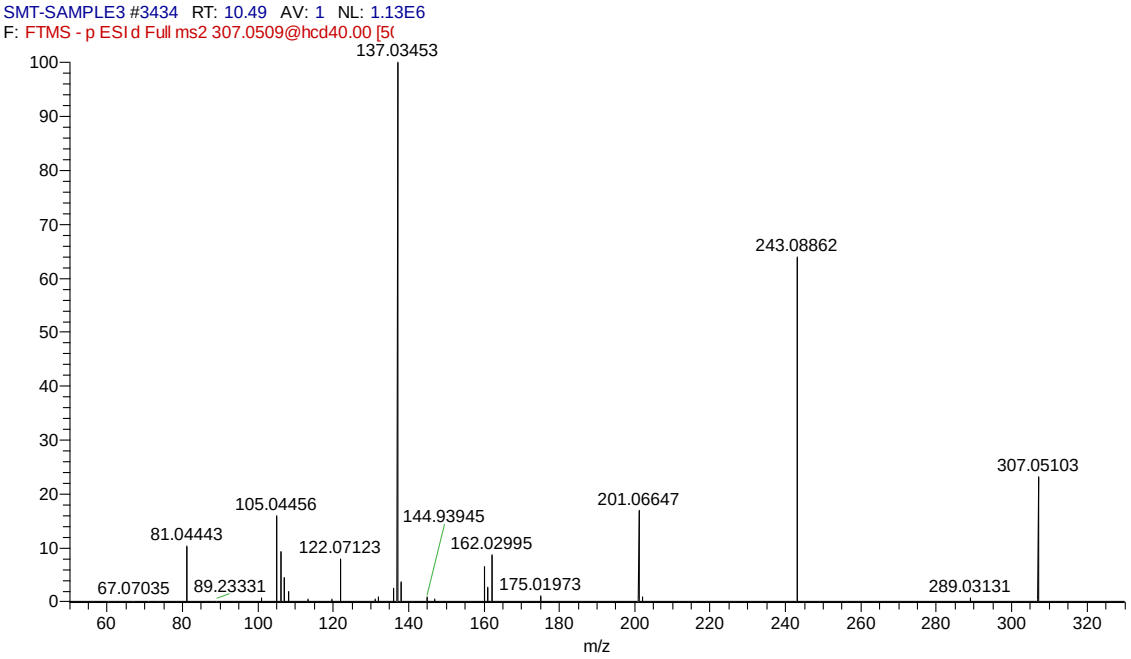
SMT



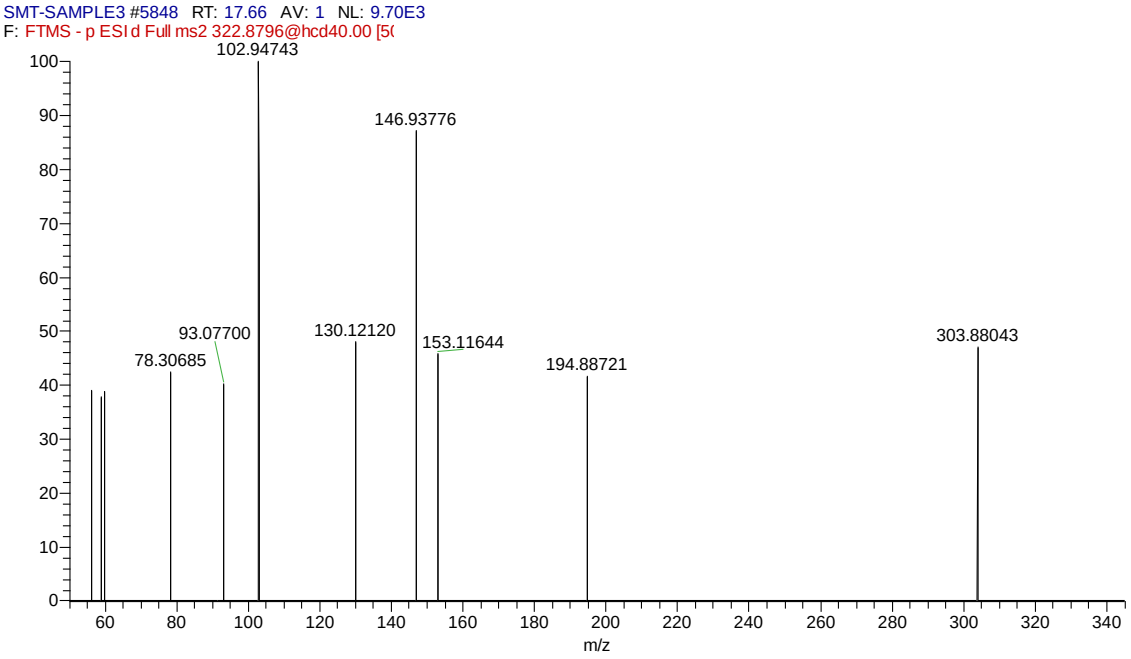
Production A



Production B

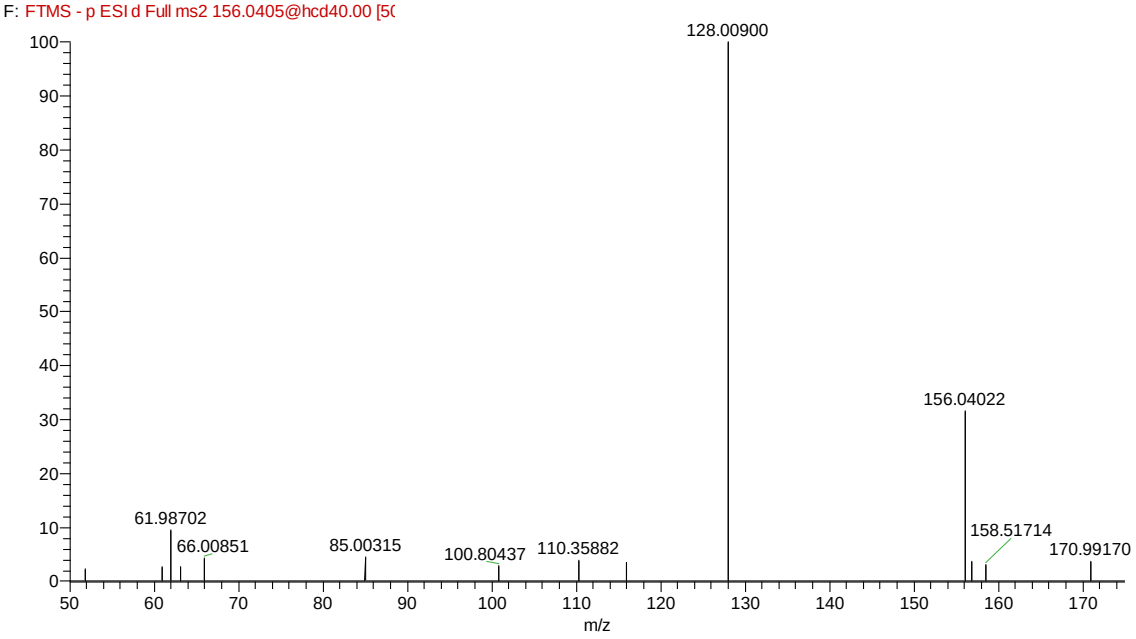


Production C



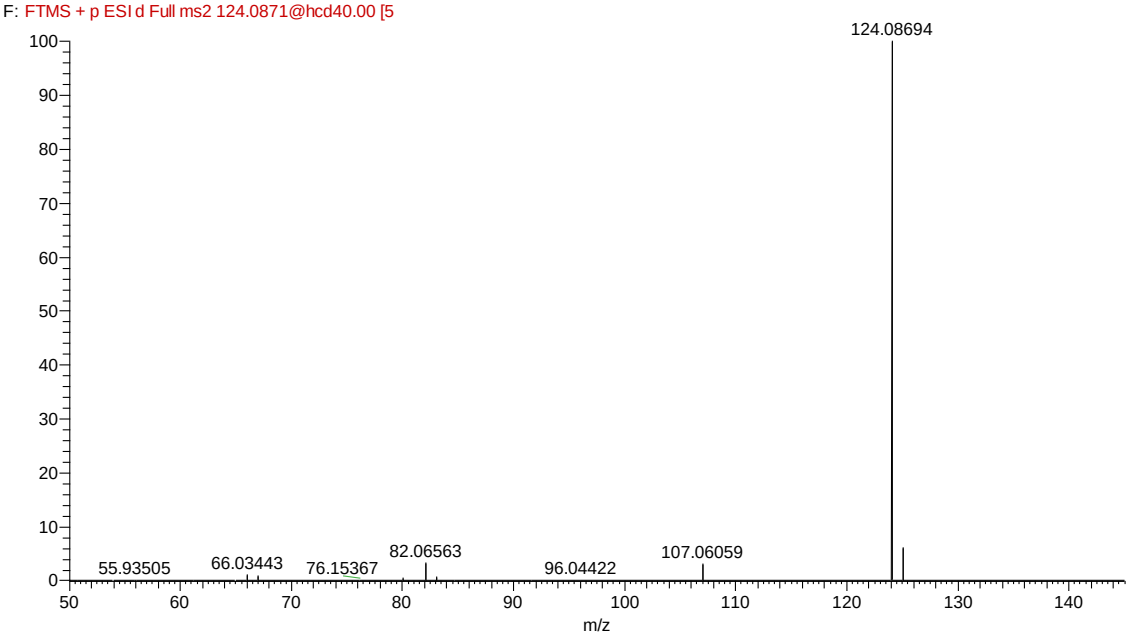
Production D

SMT-SAMPLE3 #1119 RT: 3.55 AV: 1 NL: 9.62E4
F: FTMS - p ESI d Full ms2 156.0405@hcd40.00 [5(

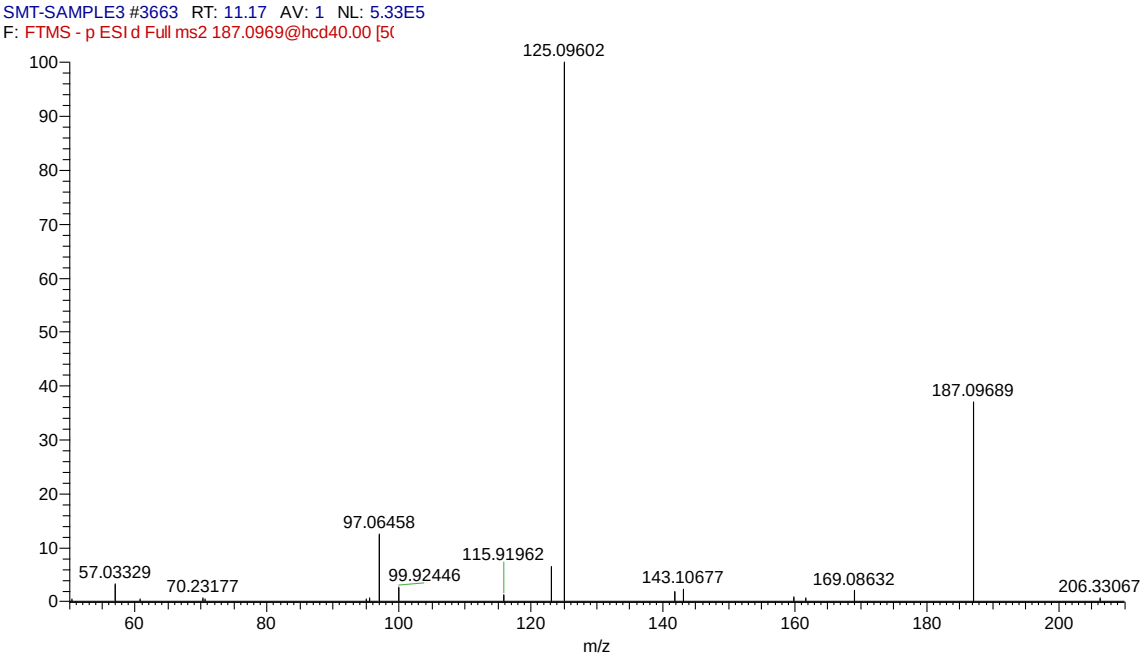


Production E

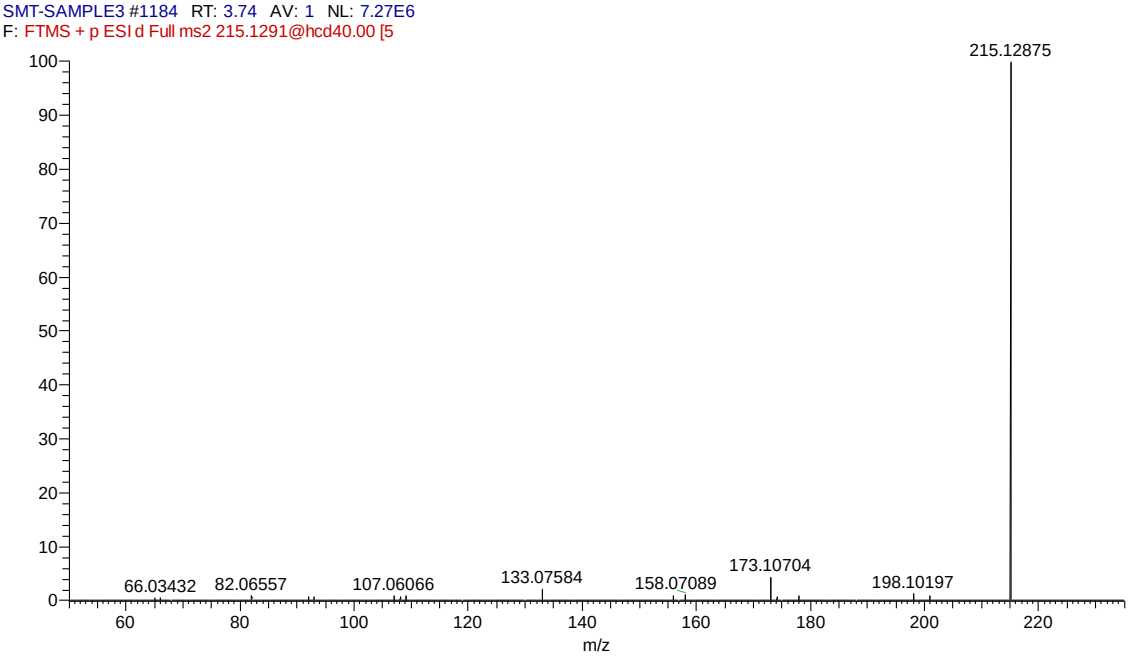
SMT-SAMPLE3 #740 RT: 2.41 AV: 1 NL: 2.77E7
F: FTMS + p ESI d Full ms2 124.0871@hcd40.00 [5



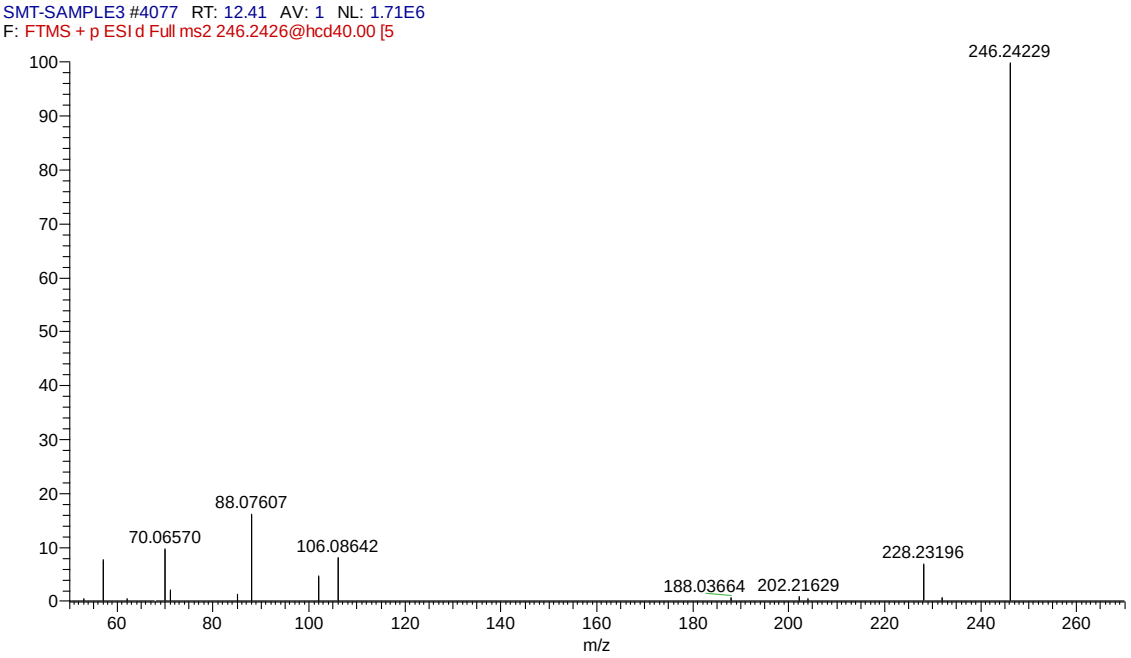
Production F



Production G



Production H



Reference:

[1] T. Chen, Q. Zhang, Z. Xie, C. Tan, P. Chen, Y. Zeng, F. Wang, H. Liu, Y. Liu, G. Liu, W. Lv, Carbon nitride modified hexagonal boron nitride interface as highly efficient blue LED light-driven photocatalyst, Applied Catalysis B: Environmental, 238 (2018) 410-421.