Supplementary Materials

S1 Materials characterizations

The N_2 adsorption/desorption isotherms were measured using a Bruna Emmett Taylor (BET Autosorb-1, USA), and the S_{BET} and pore size distribution of the catalysts were calculated. The chemical phase, composition, crystallinity and other characteristics of the samples were analyzed by X-ray diffraction (XRD, Empyrean, Netherlands). Scanning electron microscopy (SEM, Gemini Sigma, Germany) was used to observe the surface morphology and microstructure of the samples. X-ray photoelectron spectroscopy (XPS, K-Alpha, USA) was used to determine the composition, content and chemical valence states of the surface elements. Fourier transform infrared spectroscopy (FT-IR, Thermo Nicolet Is5, USA) was utilized to analyze the surface functional groups and chemical bonds. Electron paramagnetic resonance spectroscopy (EPR, A300, Germany) was conducted to confirm the existence of oxygen vacancy defects. The Bruker A300 spectrometer was used to record the electrons spin resonance (ESR, Germany) with 5, 5-dimethyl-1-pyrroline N-oxide (DMPO), 2, 2, 6, 6-tetramethylpiperidine-1-oxyl (TEMPO) as spin-trapped reagent under microwave irradiation. The UV-Vis diffuse reflectance spectra of the samples were measured using a UV-Vis-NIR spectrophotometer (3600 plus, Japan) to reveal the energy level structure of the catalyst.

S2 The testing methods for TOC and COD

S2.1 Analysis of TOC

The determination of TOC content was carried out using the TOC-L analyzer from Shimadzu, Japan. The sample was filtered through a 0.45 μm membrane filter before analysis. The combustion temperature is maintained at 680℃, and platinum catalytic oxidation occurs. Calibration was carried out using potassium hydrogen phthalate standard (0-100 mg/L). The detection limit of the system is 4 μg/L, and the relative standard deviation is less than 2%.

S2.2 Determination of COD

According to the different substrates of the wastewater, two methods are adopted:

Actual wastewater: COD was determined by the permanganate index method in

accordance with GB 11892-89 standard. Simply put, 100 mL of the sample was boiled with 10 mL of $KMnO_4$ and 5 mL of H_2SO_4 at 100°C for 10 min. Then titrate with $Na_2S_2O_3$ and perform blank correction.

Simulated wastewater: Quantitative analysis of COD was conducted using the Lianhua COD-580 portable rapid analyzer. The pre-calibrated instrument adopts sealed tube digestion, 165°C for 15 min, and spectrophotometric detection at 620 nm (range: 5-2000 mg/L COD).

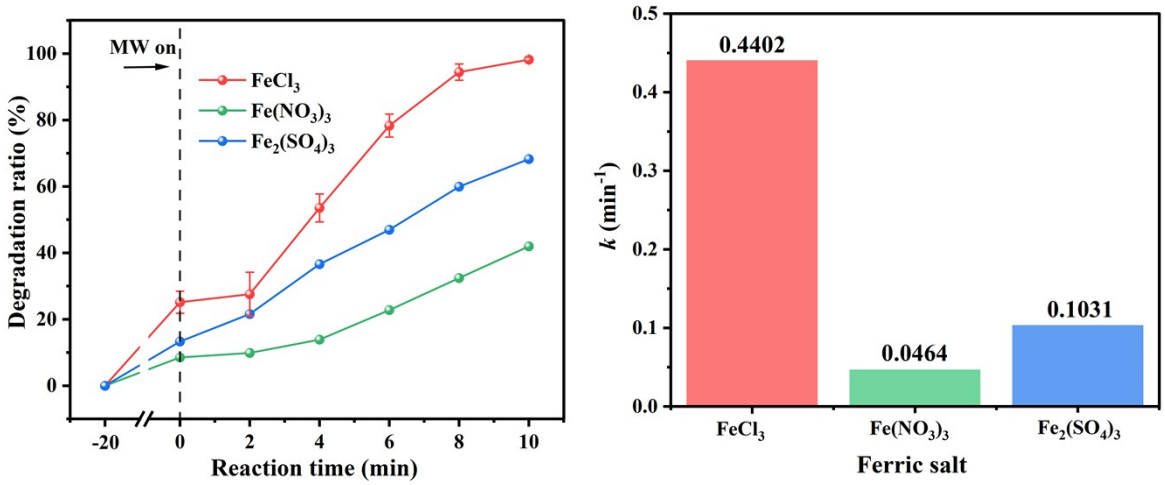


Fig. S1. The effect of different metal iron salts on the degradation rate and k of TC

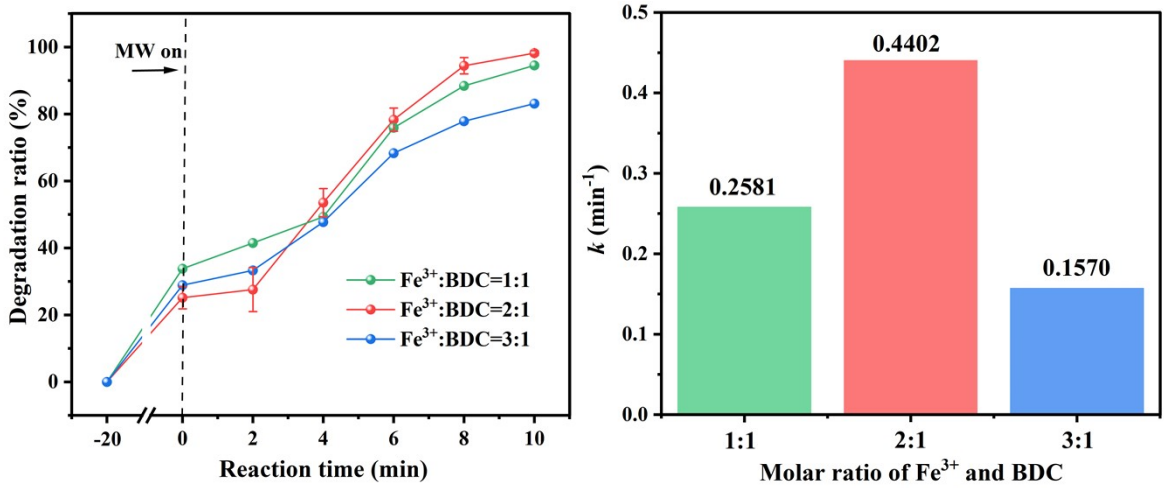


Fig. S2. The effect of molar ratio of $Fe^{3+}$to H_2BDC for the degradation rate and k of TC

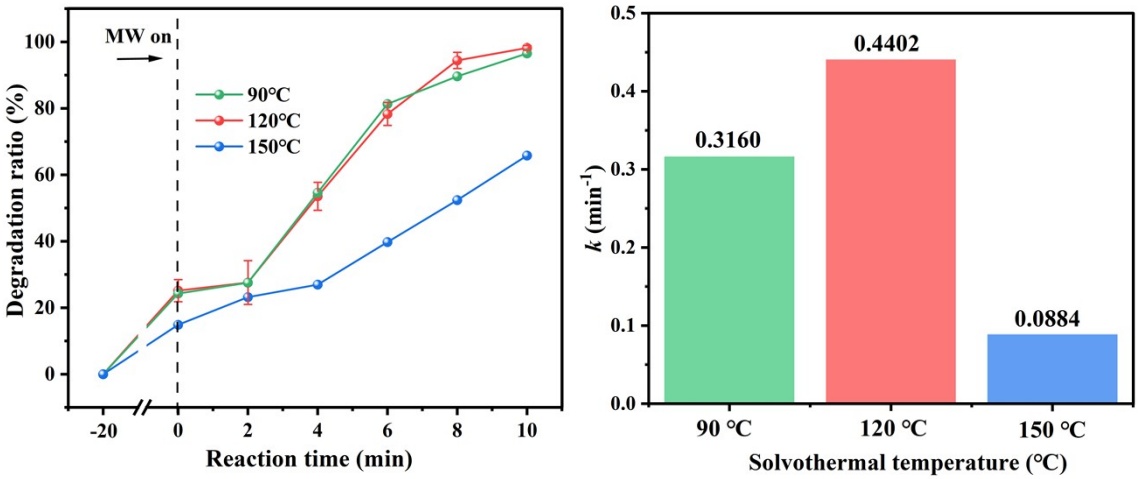


Fig. S3. The effect of solvent thermal temperature on the degradation rate and k of TC

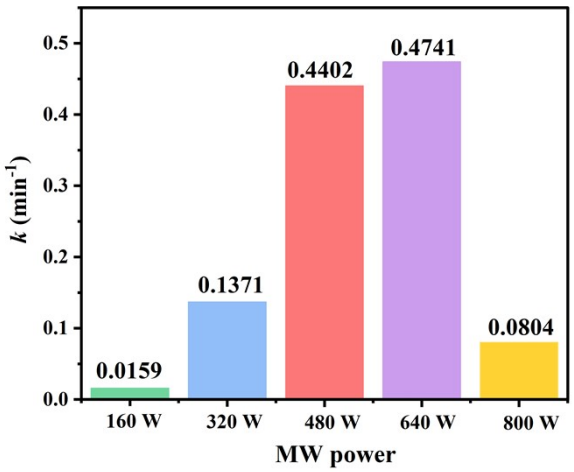


Fig. S4. The *k* value of TC degradation under different microwave powers

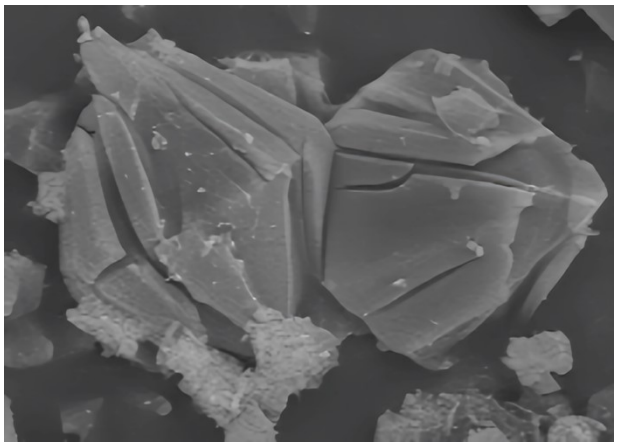


Fig. S5. SEM image of the used $FBV_{0.4}$

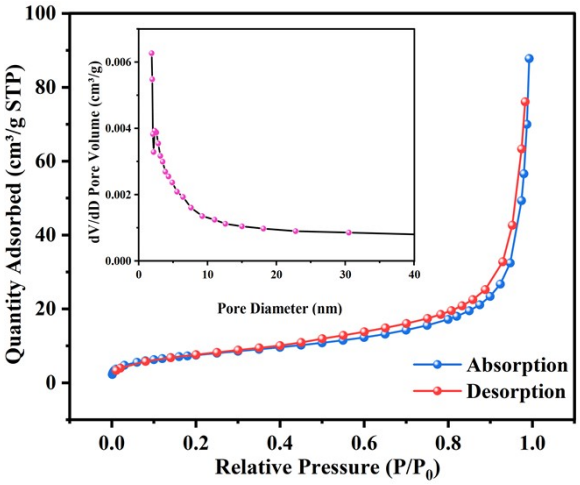


Fig. S6. N_2 adsorption/desorption isotherm and pore size distribution graph of the used $FBV_{0.4}$

Table S1. List of experimental chemicals.

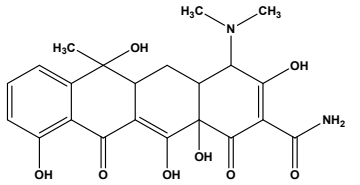
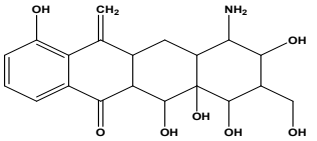
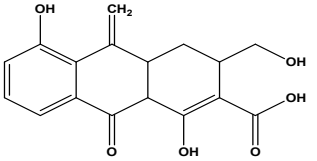
Experimental chemical	Source	category
ethanol (EtOH) (99.7%)	Tianjin Damao Chemical Reagent Factory	AR
isopropanol (IPA) (99.7%)	Tianjin Fuchen Chemical Reagent Factory	AR
p-benzoquinone (BQ) (99.7%)	Tianjin Fuchen Chemical Reagent Factory	AR
silver nitrate ($AgNO_3$) (99.8%)	Tianjin Weichen Chemical Reagent Co., Ltd	AR
NaCl	Tianjin kemio Chemical Reagent Co., Ltd	AR
Na_2CO_3		AR
$NaHCO_3$		AR
Na_2SO_4		AR
$NaNO_3$		AR
NaOH		AR
HNO_3	Tianjin Damao Chemical Reagent Factory	AR

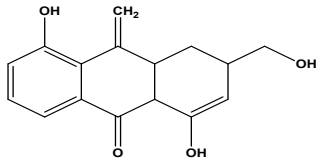
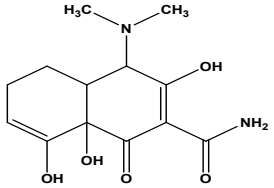
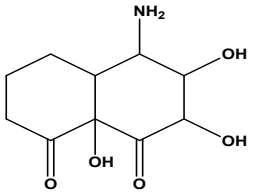
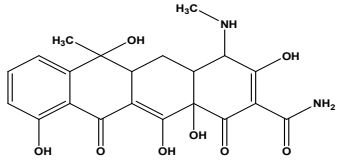
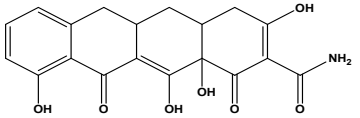
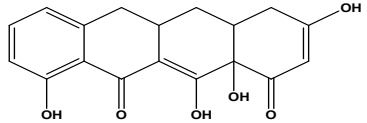
Table S2. Comparative study of metal-based catalysts in different literatures.

Catalyst	Technology	Reaction Conditions					References
		Catalyst dosage（g/L）	Concentration of TC（mg/L）	Degradation Ratio（%）	时间（min）	Others	
$FBV_{0.4}$	MW	0.4	50	98.32	10	P=480 W	This work
α-Bi_2O_3/$CoFe_2O_4$ (BO/CFO)	MW	1	1	97.55	5	P=450 W	1
ZnO/$CoFe_2O_4$ (ZO/CFO)	MW	1	1	88.23	5	P=450 W	1
Co@NCNTs-5	MW	1.5	20	99.5	6	P=520 W	2
CeNCN	Photocatalysis	0.4	10	80.09	60	λ ≥420 nm	3
MIL-MIL101Fe (NH_2) @g-C_3N_4@$CoFe_2O_4$/GO	Photocatalysis	0.4	20	90	65	λ > 420 nm	4
W-Zr-MOF-NH_2@TpTt-COF	Photocatalysis	0.3	20	90.14	40	λ < 420 nm	5
Fe-MIL-101	Photocatalysis	0.5	50	96.6	180	λ > 420 nm	6
MIL-53(Fe, Al)	Photocatalysis	0.1	20	94.33	50	λ = 365 nm	7

ZnO/ Bi_2MoO_6/ZIF-67	photocatalysis	0.4	40	90.3	90	λ = 420 nm	8
Bi_3O_4Br/NH_2-MIL-125 (Ti) BOB/NMILT	photocatalysis	0.15	25	88.5	90	λ = 357 nm	9
CuBTC/g-C_3N_4	photocatalysis	0.1	20	97.4	60	UV	10

Table S3. The intermediate products of microwave catalytic degradation of TC

Number	m/z	Chemical Formula	Name	Proposed structure
TC	445	$C_{22}H_{24}N_2O_8$	Tetracycline	
T1	396	$C_{20}H_{25}NO_7$	Acetylated nitrous oxide of senecrafinine	
T2	318	$C_{17}H_{16}O_6$	Benzoic acid,4-[(methoxycarbonyl)oxy]-, 4-ethoxyphenyl ester; Carbonicacid, methyl ester, ester with p-ethoxyphenyl p-hydroxybenzoate (8CI)	

			Methyl4-(4-ethoxyphenoxycarbonyl)phenyl carbonate	
T3	274	$C_{16}H_{16}O_4$	Benzaldehyde,4,5-dimethoxy-2-(phenylmethoxy)-; Benzaldehyde,2-(benzyloxy)-4,5	
T4	283	$C_{13}H_{18}N_2O_5$	Hydantoic acid;(S)-2-(Aminocarbonyl)-amino-3-	
T5	230	$C_{10}H_{15}NO_4$	(R)-N-BOC-Propargylglycine;(R)-N-tert-Butoxycarbonyl-2-am	
T6	432	$C_{21}H_{22}N_2O_8$	b-D-Glucopyranoside, 4-nitrophenyl2-(acetylamino)-2-deoxy-4,6-O-(phenylmethylene)-	
T7	387	$C_{20}H_{19}NO_7$	Butanoic acid,2,3-bis(benzoyloxy)-4-(dimethylamino)-4-oxo-, (2S,3S)-	
T8	330	$C_{18}H_{16}O_6$	Benzoic acid,2,3-dihydroxy-, 3-(1,3-dihydro-3-oxo-1-isobenzofuranyl)propyl ester (9CI)	

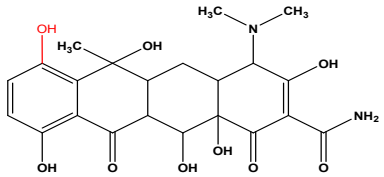
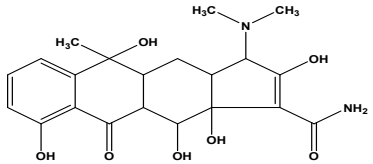
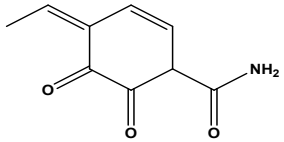
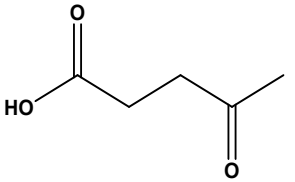
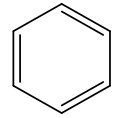
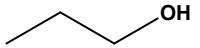
T9	461	$C_{22}H_{25}N_2O_9$	(4S,6S,12aS)-4-(dimethylamino)-3,6,10,11a,12,12a-hexahydroxy-6-methyl1,11-dioxo-1,4,4a,5,5a,6,11,11a,12,12a-decahydrotetracene-2-carboxamide	
T10	415	$C_{21}H_{22}N_2O_7$	Sancycline;(4S,4aS,5aR,12aS)-4-(Dimethyla)	
T11	183	$C_8H_9NO_4$	3,4-Dimethoxynitrobenzene;1,2-Dimethoxy-4-nitrobenzene	
T12	145	$C_5H_8O_3$	Methyl acetoacetate;3-Oxobutanoic acid methyl este	
T13	79	C_6H_6	Benzene;1,3,5-Cyclohexatriene;Benzol	
T14	60	C_3H_8O	Isopropanol;2-Propanol;Isopropyl alcohol	

Table S4 The specific surface area and pore parameters of $FBV_{0.4}$ before and after use

Catalyst	S_{BET} ($m^2 \cdot g^{-1}$)	Pore Volume ($cm^3 \cdot g^{-1}$)	Average pore size (nm)
Fresh $FBV_{0.4}$	918.214	0.5329	2.3214
Used $FBV_{0.4}$	26.066	0.0516	7.5823

Table S5 Specifications of Microwave chemical reactor

	Parameters
Rated input power (W)	1350
Rated output power (W)	800
Microwave operating frequency (MHz)	2450
External dimensions (mm)	500×420×300
Inner cavity size (mm)	320×300×200
Fuselage weight (kg)	16.5

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