Electronic Supplementary Information

Table S1. Physical and chemical properties of oxytetracycline

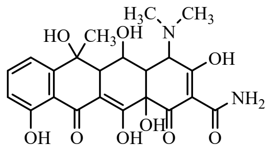
Antibiotic	Molecular formular	Chemical structure	Molecular weight (g/mol)	λ_{max} (nm)	Water solubility (mg/L)	pKa	Existing
Oxytetracycline (OTC)	$C_{22}H_{24}N_2O_9$		460.4	276 and 354 nm	200	pKa_1=3.37 pKa_2=7.49 pKa_2=9.88	OTC^+, $OTC^{zwitterion}$ OTC^-, OTC^{2-}

Table S2. The pore and surface characterization of different samples

Catalyst	BET surface area (m^2/g)[(a)]	Pore volume (cm^3/g)[(b)]	Pore size (nm)[(c)]
Natural clinoptilolite	36.21	0.097	12.18
Activated clinoptilolite	75.76	0.105	11.62
g-C_3N_4	34.41	0.127	15.83
Bi_2MoO_6	37.14	0.169	16.21
CNBC30	48.55	0.130	11.55

(a) The specific surface area was calculated by BET method

(b) The pore volume was obtained from the BJH desorption cumulative volume of pores between 1.70 nm and 300.00 nm width

(c) The BJH Desorption average pore width

Table S3. Comparison of the degradation of organic pollutants by various photocatalysts supported on clinoptilolite

Catalyst and fabricated method	Organic pollutants	Reaction conditions	Results	Remarks	References
MoS_2/TiO_2/clinoptilolite (MTC3 – 1mmol $Na_2MoO_4.2H_2O$) 2-step hydrothermal	Sodium isopropyl xanthate (SIPX) (λ_{max} = 301 nm)	[catalyst] = 0.4 g/L, [SIPX] = 10 mg/L, 400W Xe lamp	SIPX: 97.3 % (3 h) Main ROS: $h^+ < e^- < OH^\bullet < O_2^{\bullet-}$	- Complicated synthesis process - Long degradation duration	[1]
TiO_2/NCP (96.6 % NCP) Heating	Atenolol (λ_{max} = 284 nm)	[catalyst] = 3 g/L, [atenolol] = 10 mg/L [1], UV lamp 60 W,	Atenolol: 75 % (1h) Main ROS: h^+ and $OH^\bullet$ Mineralization efficiency: 74 % Final products: CO_2 and H_2O	- High energy requirement due to calcination at high temperature - Low degradation efficiency - High cost due to UV light - Great amount of catalyst - Degradation efficiency decreased at pH > 6.0	[2]
ZnO/Fe_2O_3/Clinoptilolite (44 % Clinoptilolite, Fe^{3+}/ZnO = 0.06) Sol-Gel	Metronidazole (MNZ) (λ_{max} = 254 nm)	[catalyst] = 1 g/L, [MNZ] = 60 mg/L, $[H_2O_2]$ = 40 mg/L, pH = 10 UV lamp 8 W, reaction time = 90 min	MNZ: 99 % (90 min)	- Narrow pH range, good performance at base medium - High cost due to UV light - Great amount of catalyst	[3]

Catalyst and fabricated method	Organic pollutants	Reaction conditions	Results	Remarks	References
TiO_2/Fe_2O_3/Clinoptilolite (Fe^{3+}/TiO_2 = 0.6, 25 % Clinoptilolite) Hydrothermal	Diphenhydramine (DPH) (λ_{max} = 258 nm)	[catalyst] = 0.5 g/L, pH=5, [DPH] = 50 mg/L, [H_2O_2] = 50 mg/L, UV lamp 6 W	80 % DPH (120 min)	- High energy requirement due to calcination at high temperature - Narrow pH range, good performance at acid medium - High cost due to UV light	[4]
ZnO/Fe_2O_3/Clinoptilolite (Fe^{3+}/ZnO = 0.6, 25 % Clinoptilolite) Sol-Gel	Diphenhydramine (DPH) (λ_{max} = 258 nm)	[catalyst] = 0.5 g/L, pH=10, [DPH] = 50 mg/L, [H_2O_2] = 50 mg/L, UV lamp 6 W	95 % DPH (100 min)	- Narrow pH range, good performance at base medium - High cost due to UV light	[5]
BiOCl/TiO_2/clinoptilolite (TiO_2/clinoptilolite = 1.5, BTC1 - 0.25 mmol Bi^{3+}) Hydrothermal + water bath precipitation	Sodium isopropyl xanthate (SIPX) (λ_{max} = 301 nm)	[catalyst] = 0.2 g/L, [SIPX] = 20 mg/L, 400W Xe lamp	SIPX: > 90 % (3 h) Main ROS: $e^- < OH^\bullet < h^+ < O_2^{\bullet-}$	- Complicated synthesis process - Long degradation duration	[6]
TiO_2/CLP/graphene (30% clinoptilolite, 1 % graphene) Hydrothermal + Solvothermal	Nitenpyram (λ_{max} < 400 nm)	[Nitenpyram] = 80 mg/L, 570 W Xe lamp	100 % Nitenpyram (90 min) Mineralization efficiency: 71%	- Complicated synthesis process - Long degradation duration	[7]

Catalyst and fabricated method	Organic pollutants	Reaction conditions	Results	Remarks	References
			Main ROS: $h^+ < O_2^{\bullet-} < OH^{\bullet}$		
$g\text{-}C_3N_4/Bi_2MoO_6$/clinoptilolite (CNBC-30, 30 % clinoptilolite) Solvothermal	Oxytetracycline (OTC) (λ_{max} = 354 nm)	[OTC] = 20 mg/L; [catalyst] = 500 mg/L; [$Na_2S_2O_8$] = 1.26 mM; pH initial; L4X 40 W LED lamp	87.47 % OTC (120 min)	- Low dosage of catalysts and PDS - Wide range of pH (3-11) - Environmental friendliness energy (LED light) - High degradation efficiency	This work

Table S4. The removal of organic pollutants from water by photocatalysts in the presence of persulfate and visible light

Photocatalyst	Organic pollutants	Reaction conditions	Time	Degradation efficiency	Main ROS	References
TiO_2/AB	Tetracycline (TC)	[TC] = 30mg/L [catalyst] = 500 mg/L [PDS] = 3 mM	120 min	93.3 %	$SO_4^{\bullet-}$	[8]
g-C_3N_4	Bisphenol A (BPA)	[BPA] = 5 mg/L [catalyst] = 0.5 g/L [PDS] = 5mM	90 min	99.5 %	$O_2^{\bullet-}$, h^+	[9]
CeO_2/g-C_3N_4	Norfloxacin (NOR)	[NOR] = 10 mg/L [catalyst] = 1 g/L [PDS] = 5 mM	60 min	88.6 %	$^1O_2$, $O_2^{\bullet-}$, h^+ and $OH^{\bullet}$	[10]
Cu/ZnO/CoFe–CLDH	Bisphenol-A (BPA)	[BPA] = 10 mg/L [catalyst] = 0.5 g/L [PDS] =0.148mM	6 h	99 %	$SO_4^{\bullet-}$, $OH^{\bullet}$, $O_2^{\bullet-}$, $^1O_2$	[11]
Bi_2MoO_6	Tetracycline (TC)	[TC] = 20 mg/L [catalyst] = 0.5 g/L [PDS] = 16.8 mM	60 min	95.18 %	$SO_4^{\bullet-}$, h^+	[12]
$ZnFe_2O_4$	Bisphenol-A (BPA)	[BPA] = 10 mg/L [catalyst] = 0.2 g/L [PDS] = 8 mM	120min	96.5%	$SO_4^{\bullet-}$, $OH^{\bullet}$, h^+	[9]

Photocatalyst	Organic pollutants	Reaction conditions	Time	Degradation efficiency	Main ROS	References
g-C_3N_4/Bi_2MoO_6/clinoptilolite (CNBC-30)	Oxytetracycline (OTC)	[OTC] = 20 mg/L [catalyst] = 500 mg/L [PDS] = 1.26 mM	120 min	87.47 %	$^1O_2$, $O_2^{\bullet -}$, and h^+	This work

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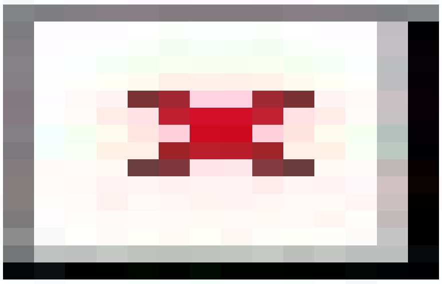

Fig. S1. Calibration curve of oxytetracycline

(b)

Fig. S2 (a) Mott-Schottky of various catalysts, (b) XPS spectra of survey scan

Fig. S3. The k_{app} values of (a) different systems, (b) % clinoptilolite, (c) catalyst dosage, (d) PDS concentration, (e) initial pH, and (f) OTC concentration

(Reaction conditons: [OTC] = 10-50 mg/L; [catalyst] = 0-600 mg/L; [$Na_2S_2O_8$] = 0-2.10 mM; pH = 3-11; T=30 ^oC)

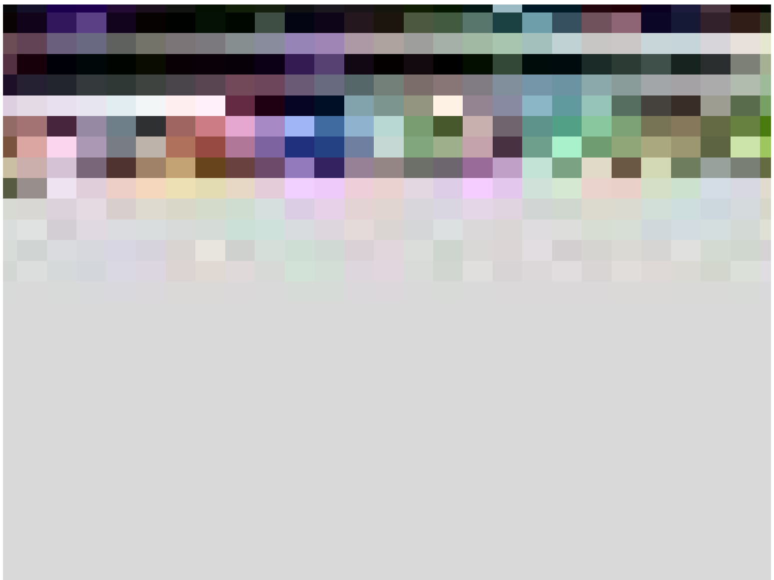

Fig. S4. UV-Vis absorption spectrometry of OTC using CNBC-30 during 120 min (30 min of adsorption and 90 min of photocatalysis)

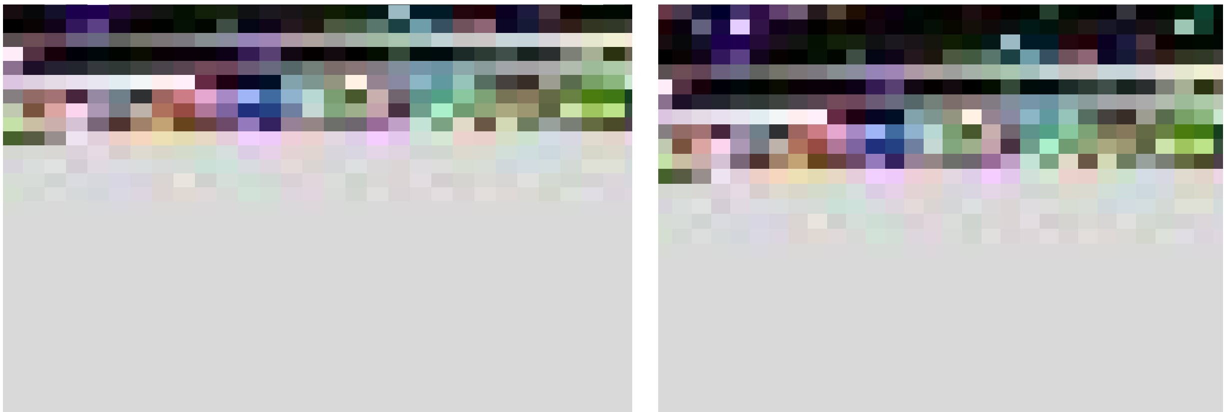

Fig. S5. (a) Schematic diagram of OTC species distribution according to pH and (b)pH_{pzc} of CNBC-30

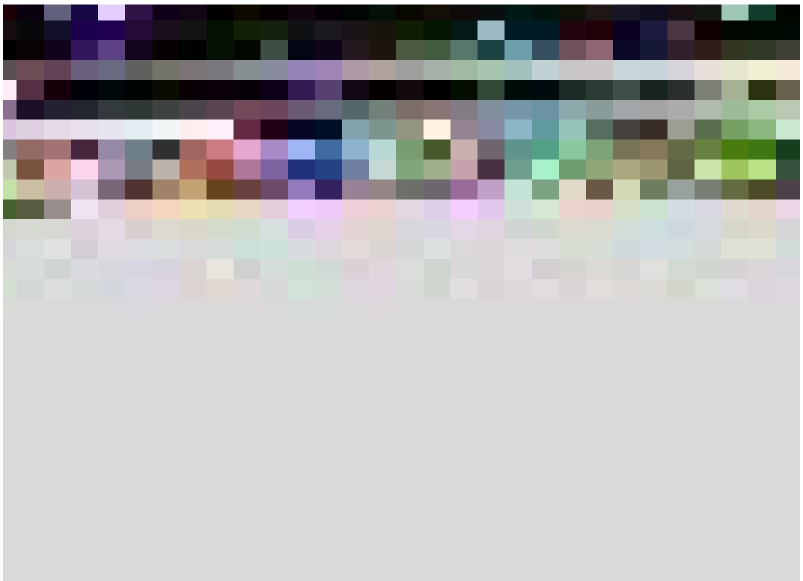

Fig. S6. The k_{app} values of reaction with the presence of different ions

Fig. S7. Mass spectrum of OTC decomposition over time from 0 - 90 minutes