

**Unveiling intrinsic electrochemical mechanism of supporting electrolyte and interaction
mechanism in electrochemical oxidation tetracycline with nano-PbO₂**

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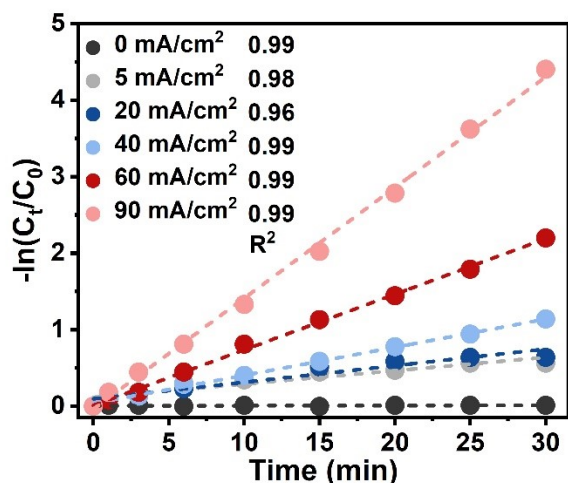


Fig. S1 Kinetic curve of different current density on the removal of TC. Reaction conditions: Initial TC concentration of 2.5 mg L⁻¹, the electrode spacing of 2.0 cm, the electrolyte concentration of 10.0 mM L⁻¹.

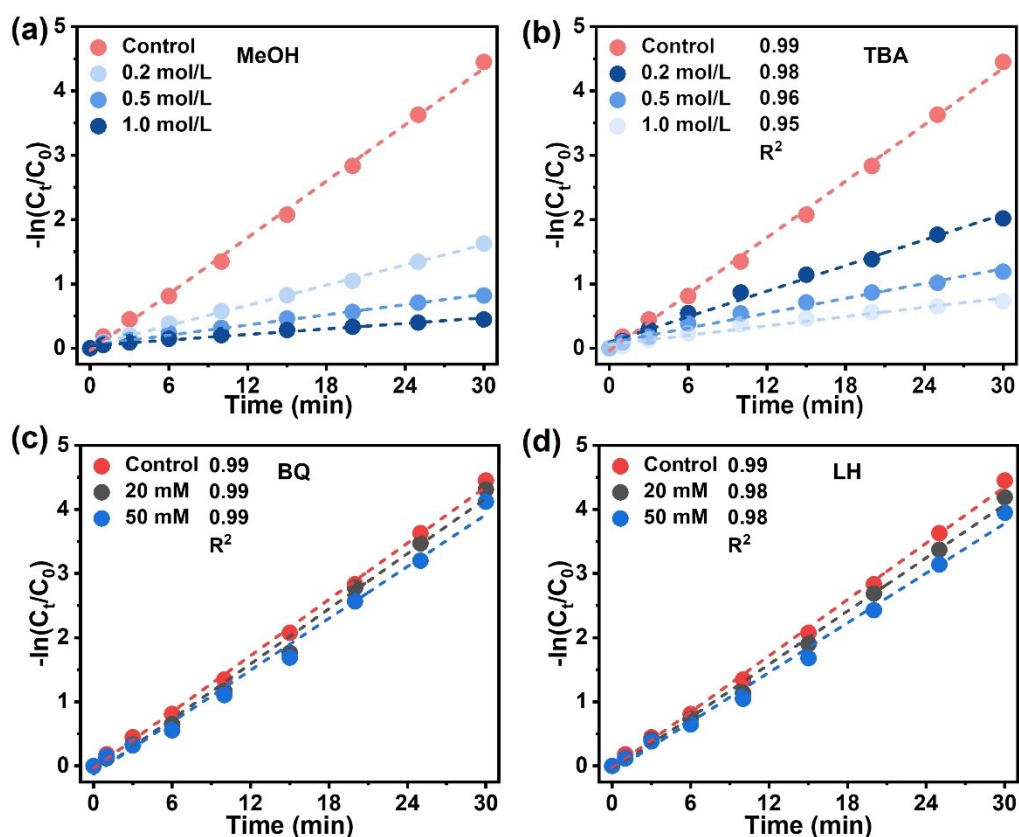


Fig. S2 Kinetic curve of different quenchers on the removal of TC. Reaction conditions: Initial TC concentration of 2.5 mg L⁻¹, the electrode spacing of 2.0 cm, the electrolyte concentration of 10.0 mM L⁻¹, the current density of 90 mA cm⁻¹.

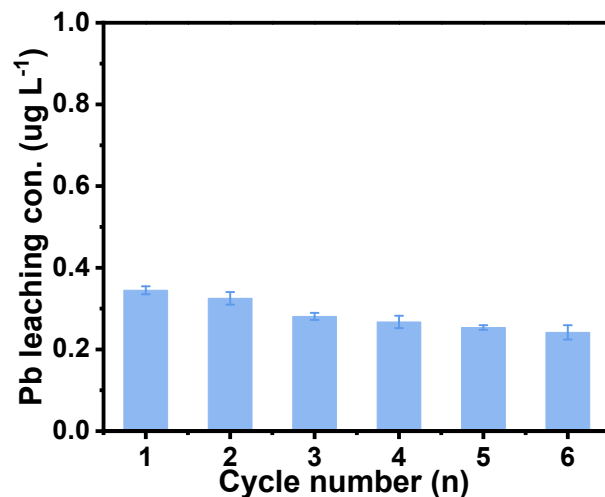


Fig. S3 The leaching concentration of Pb ion after multiple cycles operations. Reaction conditions: Initial TC concentration of 2.5 mg L⁻¹, the electrode spacing of 2.0 cm, the electrolyte concentration of 10.0 mM L⁻¹, the current density of 90 mA cm⁻¹.

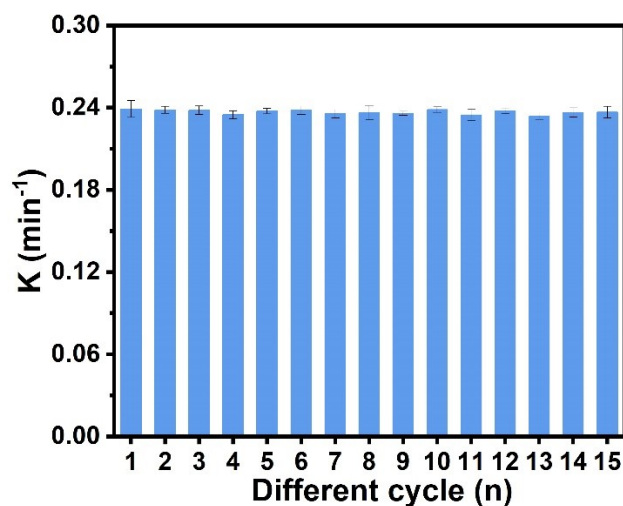


Fig. S4 The kinetic rate constant for tetracycline removal under continuous 15-cycles operations. Reaction conditions: Initial TC concentration of 2.5 mg L⁻¹, the electrode spacing of 2.0 cm, the electrolyte concentration of 10.0 mM L⁻¹, the current density of 90 mA cm⁻¹.

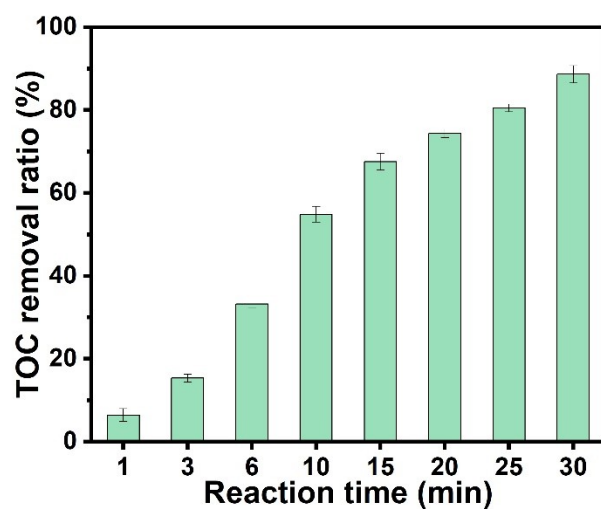


Fig. S5. The TOC removal ratio with the reaction time under the EO/PMS system. Reaction conditions: Initial TC concentration of 2.5 mg L^{-1} , the electrode spacing of 2.0 cm, the electrolyte concentration of 10.0 mM L^{-1} , the current density of 90 mA cm^{-1} .

Table S1. The calculated Fukui index value via DFT calculations.

Atom	q(N)	q(N+1)	q(N-1)	f-	f+	f ₀	CDD
1(C)	-0.0605	-0.0965	-0.0583	0.0022	0.0360	0.0191	0.0338
2(C)	0.0897	0.0422	0.0912	0.0015	0.0475	0.0245	0.0460
3(C)	-0.0418	-0.0703	-0.0407	0.0011	0.0285	0.0148	0.0274
4(C)	0.0082	-0.0321	0.0092	0.0010	0.0403	0.0206	0.0393
5(C)	-0.0527	-0.0823	-0.0508	0.0020	0.0296	0.0158	0.0276
6(C)	-0.0179	-0.0857	-0.0162	0.0017	0.0678	0.0347	0.0661
8(C)	0.0941	0.0883	0.0954	0.0013	0.0059	0.0036	0.0046
11(C)	-0.0142	-0.0212	-0.0126	0.0016	0.0070	0.0043	0.0053
12(C)	-0.0497	-0.0805	-0.0477	0.0020	0.0309	0.0164	0.0289
13(C)	0.0697	0.0588	0.0736	0.0040	0.0109	0.0074	0.0069
14(C)	-0.0648	-0.0688	-0.0498	0.0151	0.0040	0.0095	-0.0111
15(C)	0.1321	0.1286	0.1303	-0.0017	0.0035	0.0009	0.0052
16(C)	0.0187	0.0175	0.0546	0.0360	0.0012	0.0186	-0.0348
18(C)	0.0979	0.0185	0.0980	0.0001	0.0793	0.0397	0.0792
20(C)	0.1383	0.0126	0.1404	0.0020	0.1257	0.0639	0.1237
21(O)	-0.2220	-0.3338	-0.2189	0.0031	0.1118	0.0575	0.1087
22(C)	0.1379	0.1330	0.1447	0.0068	0.0049	0.0059	-0.0019
23(O)	-0.2972	-0.3113	-0.2801	0.0171	0.0141	0.0156	-0.0030
24(C)	0.1684	0.1657	0.1736	0.0052	0.0027	0.0040	-0.0025
25(O)	-0.3927	-0.3973	-0.3826	0.0101	0.0047	0.0074	-0.0054
26(O)	-0.1405	-0.1451	-0.1303	0.0101	0.0047	0.0074	-0.0055
28(O)	-0.2317	-0.2423	-0.2224	0.0093	0.0107	0.0100	0.0014
30(C)	-0.0856	-0.0909	-0.0838	0.0018	0.0053	0.0035	0.0035
34(N)	-0.1083	-0.1095	0.1710	0.2793	0.0012	0.1403	-0.2781
35(O)	-0.2520	-0.2717	-0.2434	0.0087	0.0196	0.0142	0.0110
37(N)	-0.0969	-0.0986	-0.0928	0.0041	0.0017	0.0029	-0.0024
40(C)	-0.0405	-0.0417	0.0168	0.0574	0.0011	0.0292	-0.0562
44(C)	-0.0527	-0.0538	0.0084	0.0611	0.0011	0.0311	-0.0600
48(O)	-0.1918	-0.2520	-0.1886	0.0031	0.0602	0.0317	0.0570
50(O)	-0.2239	-0.2641	-0.2223	0.0017	0.0402	0.0209	0.0385
52(C)	-0.0414	-0.0468	-0.0360	0.0053	0.0054	0.0054	0.0001
55(C)	-0.0192	-0.0216	-0.0086	0.0106	0.0025	0.0065	-0.0082

Table S2. The comparison of some previously reported studies on the removal of TC with our study.

Method	Electrode	Reaction condition for TC removal	Removal (%)	Treatment time	Rate (min ⁻¹)	Reference s
Electro-Fenton	CoSA	Initial con. of 20 ppm, Na ₂ SO ₄ of 50 mM, voltage of 0.2 V, pH of 3.0, Fe ²⁺ con. of 0.5 mM.	94.9%	120 min	0.024	1
Electro/PMS	NiFe ₂ O ₄	Initial con. of 30 ppm, PMS of 1 mM, Current density = 2.5 mA cm ⁻² , pH of 6.0.	81.7%	60 min	0.030	2
Electro-Fenton	ZIF-8	Initial con. of 20 ppm, Na ₂ SO ₄ = 100 mM, current density = 12 mA cm ⁻² , PMS = 5 mM, Co ²⁺ con. of 15 ppm, pH of 5.0.	96.4%	120 min	0.027	3
Electro-Fenton	CoNC	Initial con. of 20 ppm, Na ₂ SO ₄ = 100 mM, current density = 6 mA cm ⁻² , pH of 5.0, O ₂ con. of 0.6 mL min ⁻¹ .	100%	30 min	0.042	4
Photocatalysis	C ₃ N ₄	Initial con. of 10 ppm, photo power of 250 W, catalyst con. of 300 mg pH of 6.0.	88%	30 min	0.065	5
Photo-Fenton	In ₂ O ₃ /FeIn ₂ S ₄	Initial con. of 20 ppm, photo power of 300 W, pH of 6.8, catalyst con. of 20 mg, H ₂ O ₂ of 250 μL.	98.3%	75 min	0.058	6
Photocatalysis	COF	Initial con. of 20 ppm, photo power of 300 W, catalyst con. of 0.2 ppm.	87.3%	90 min	0.198	7
Photocatalysis/ Gas-liquid discharge	TiO ₂	Initial con. of 50 ppm, pulse Voltage of 8 kV, working gas flow rate of 60 mL min ⁻¹ , pH of 6.0.	90.2%	10 min	0.244	8
PMS	NiCo ₂ O ₄	Initial con. of 10 ppm, PMS of 0.8 mM, catalyst con. of 0.1 ppm, pH of 7.0	98.1%	20 min	0.182	9
Photocatalysis	MgO/g-C ₃ N ₄	Initial con. of 20 ppm, photo source of sunshine, Na ₂ SO ₄ = 100 mM, pH of 5.6, cathode bias of -0.5 V.	96.8%	30 min	0.167	10
Electrooxidation/PMS	PbO ₂	Initial con. of 10 ppm, PMS = 0.4 mM, current density = 5 mA cm ⁻² .	100%	12 min	0.239	This study

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