Supplementary

Table S1 Main metal elements and properties of celery

Metal (mg/kg DW)						pH	Moisture content (%)
K	Ca	Mg	Al	Fe	Zn		
$91.2\times10^{3*}$	$23.7\times10^{3*}$	4502.4*	3363.6	943.1*	87.8	6.05	93.7

Note: *content of metal element adopted in interference test

Table S2 Contents of major matrix substances in celery and the concentration for interference test

Phytochemical	Content（FW）	Reference	Concentration for test
Nitrate	149.6 mg/100g	[18]	150 mg/100 g
	490-1400 mg/kg	[19]	
Glucose	0.40 g/100g	[20]	400 mg/100 g
Aspartic acid	0.117g/100g	[20]	120 mg/100 g
Oxalate	23 mg/100 g	[21]	40 mg/100 g
Chlorogenic acid	0.268-0.712 mg/g	[22]	100 mg/100g
Ascorbic acid	5.35-10.55 mg/100 g	[23]	20 mg/100 g
	799.05 μg/g DW	[24]	
	3.1 mg/100g	[20]	
Chlorophyll	0.81 mg/g	[25]	100 mg/100 g
β-Carotene	0.9915 mg/100g	[26]	1 mg/100 g
	270ug/100g	[20]	
Apigenin	0.682-164.7 mg/kg DW	[27]	5 mg/100 g
	283.21 mg/kg DW	[28]	

Table S3 R_s, R_f, and W_s values calculated through CNLS

	GPE	NA-LO/GPE
R_s (ohm)	4.93	5.72
CPE1 (mF)	1.05	0.95
R_f (ohm)	12.88	13.27
CPE2 (mF)	/	0.59
R_{ct} (ohm)	/	548.02
W_s (ohm)	498.4	375.97

Table S4 Comparison of NF-LO/GPE with other electrochemical detections of TMX

Electrode	Reproducibility	Storage Stability	Method	LOD	Linear range	Samples	Recovery Rate	Reference
NF-LO/GPE	3.89%	91.33% (14 d)	LSV	0.028 mg/L 0.097 μM*	0.1-36 mg/L 0.34-123.71 μM*	Celery	80.49%-104.64%	This study
Poly(L-Ornithine)/GCE	2.90%	95.4 % (14 d)	LSV	0.17 μM	0.5-9 μM	Insecticide	96.51%~98.35%	[4]
β-CD-rGO/GCE	4.3%	93.4% (7 d)	LSV	0.27 μM	0.5-16 μM	Brown rice	92.20%~113.75%	[5]
Ag@Gr/GCE	4.41%	90% (14 d)	SWV	1.92 μM	5 μM-1 mM	Tomato	90.17%~103.28%	[40]
rGO/GCE	5.1%	-	SWV	8.3 mM	10-200 mM	Water, Honey	95.0%~99.8%	[52]
Nanosilver/SDS/GCE	3.9%	-	DPV	0.1 μM	0.1-9 μM	Potato	92.06%~97.40%	[53]
CB/SiTiSb/GCE	3.61%	98.58% (15 d)	DPV	0.012 μM	0.25-100.5 μM	Water, Honey	86.9%~102.0%	[7]
MCH/Apt/AuNPs/rGO/SPE	1.34%	83.36% (10 d)	DPV	0.5 μM	0.5-3 μM	Water, Mango	88.08%~111.75%	[9]
Fe/BPDCA@GRP/MOF	2.14%	> 96.85% (40 d)	DPV	3.44 nM	5-100 μM	Orange	98.7%~103.2%	[54]

Table S5 Recovery rates of thiamethoxam in spiked samples (n=3)

spiked concentration (mg/kg)	Recovery %			RSD
0.05	83.16	81.09	92.21	5.91
0.1	95.11	80.49	85.45	7.44
0.5	104.64	95.61	90.96	6.96

Note: no TMX or CLO (< 0.01mg/kg) in unspoked celery detected by HPLC

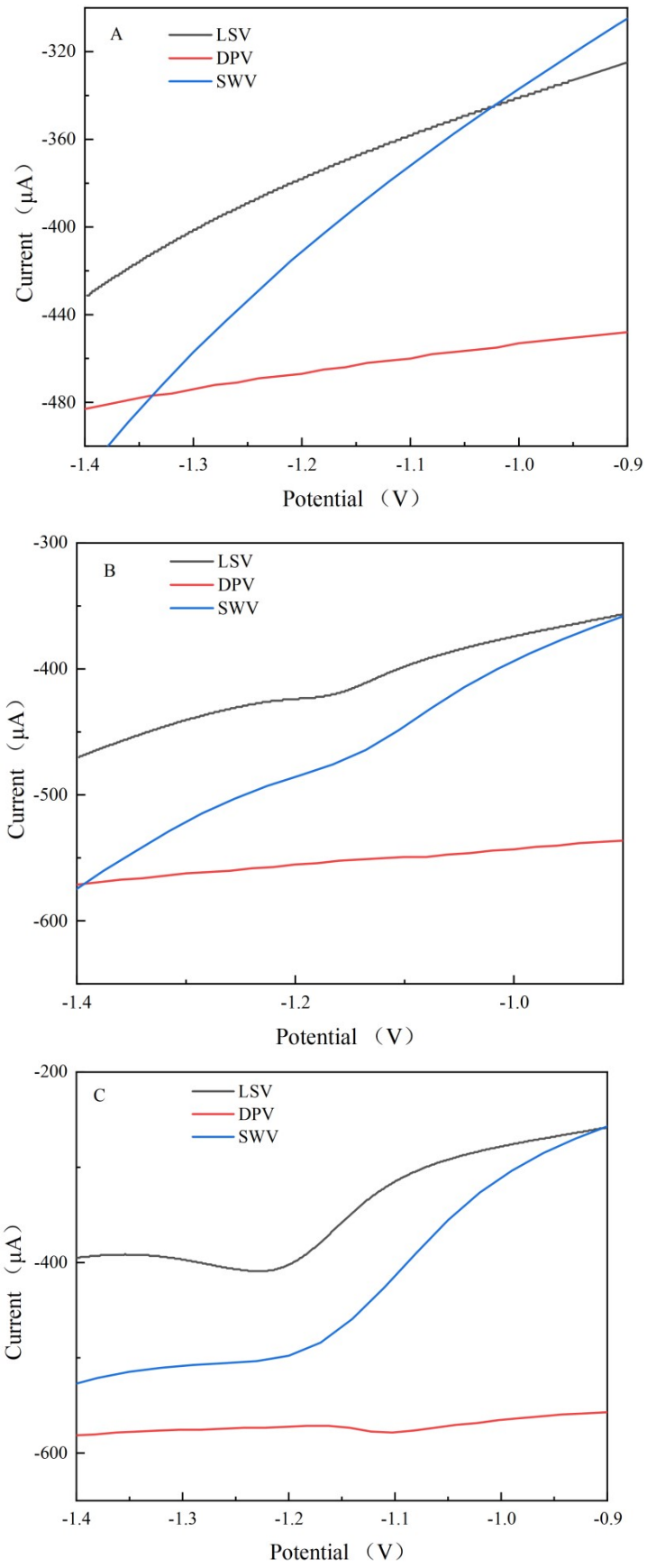


Fig. S1 Voltammograms of CK and TMX with three detection methods. A for CK voltammetry curve, B for 1 mg/L TMX detection, and C for 10 mg/L TMX detection.

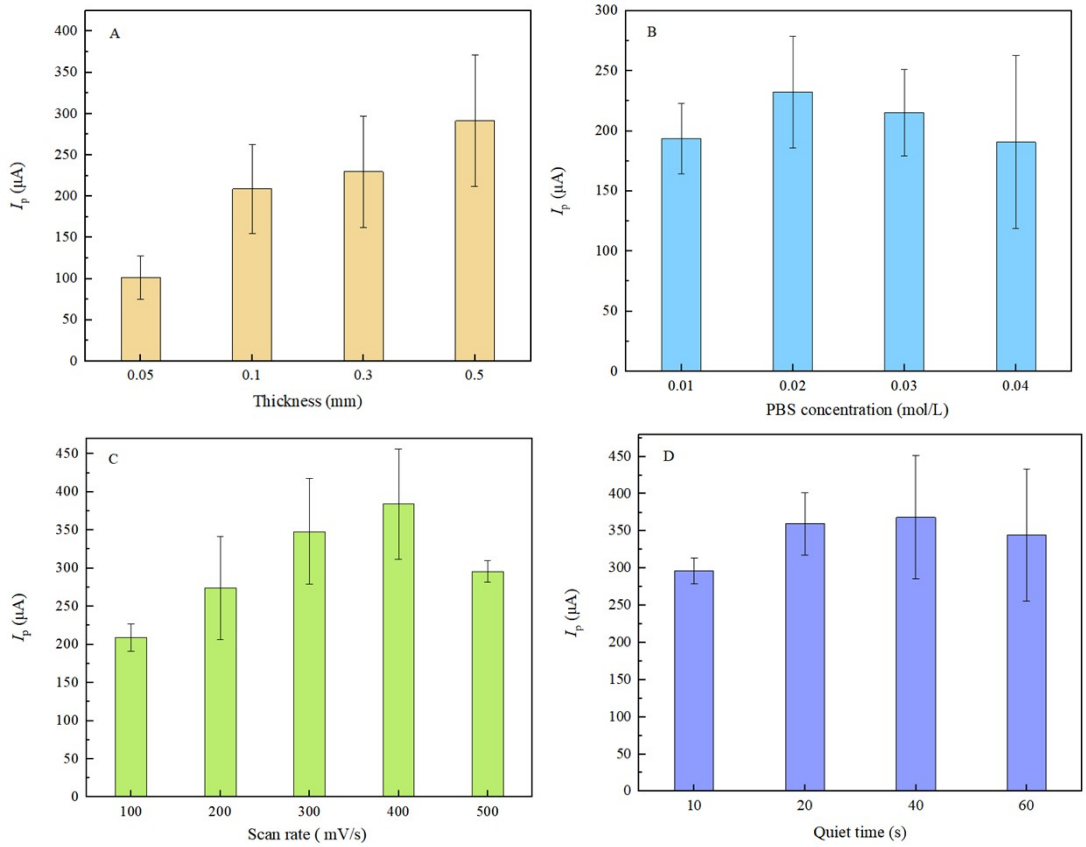


Fig. S2 Effect of graphite paper thickness (A), PBS cncentration (B), scan rate (C) and quiet time (D) on detecting 10 mg/L TM. (A), (B) and (C) with the conditions of 0.01M PBS, 100 mV/s, and quiet at -0.6 V for 20s. (D) with the conditions of 0.02M PBS, 400 mV/s. And the work electrode in (B), (C) and (D) is 0.1mm-thick, 1x1 cm GPE.

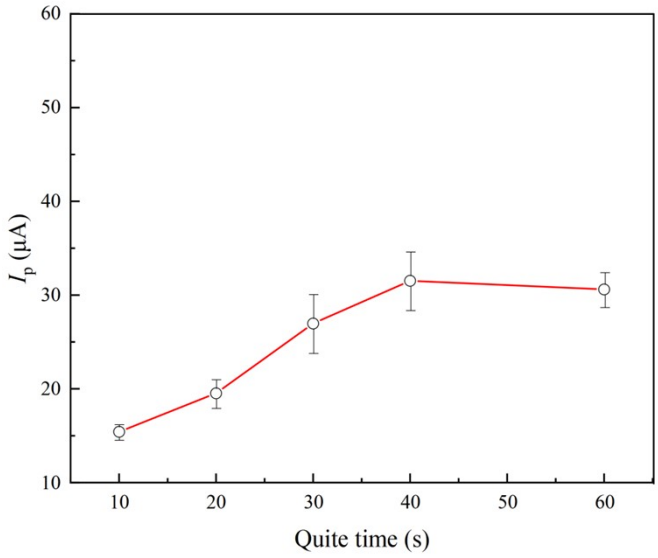


Fig. S3 Effect of quiet adsorption time on the peak current of low-concentration TMX (1 mg/L).

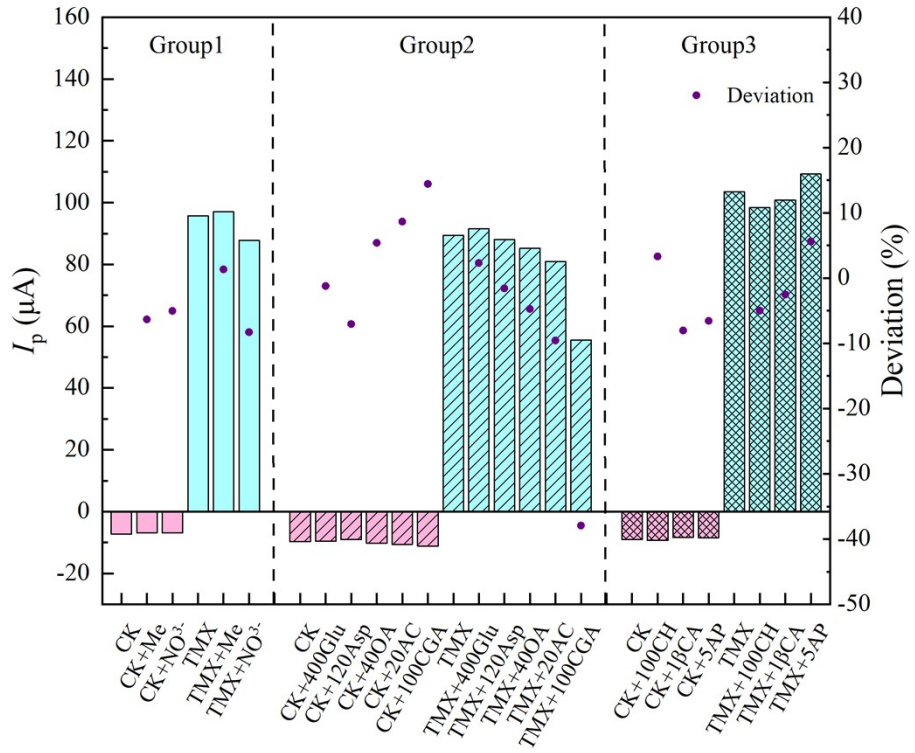


Fig. S4 Interferences of matrix substances on TMX (5 mg/L) detection. Group (1): 150mg/100g Nitrate and Me (including Mg^{2+}, K^{+}, Ca^{2+} and Fe^{3+}). Group (2): Water-soluble organic matters included 400 mg/100g of Glu, 120 mg/100g of Asp, 40 mg/100g of OA, 20 mg/100g of AC and 100 mg/100g of CGA. Group (3): Plant pigment-derived hydrophobic organic matter included 25 mg/100g of CH, 1 mg/100g of βCA and 5 mg/100g of AP.

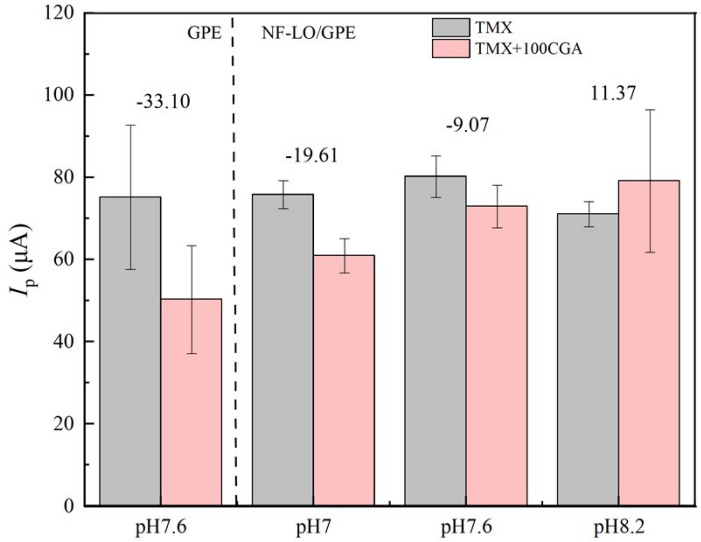
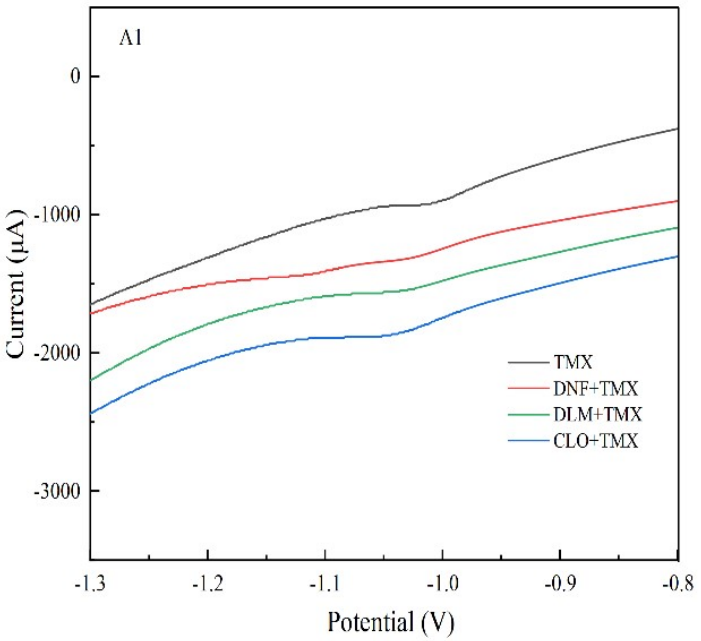
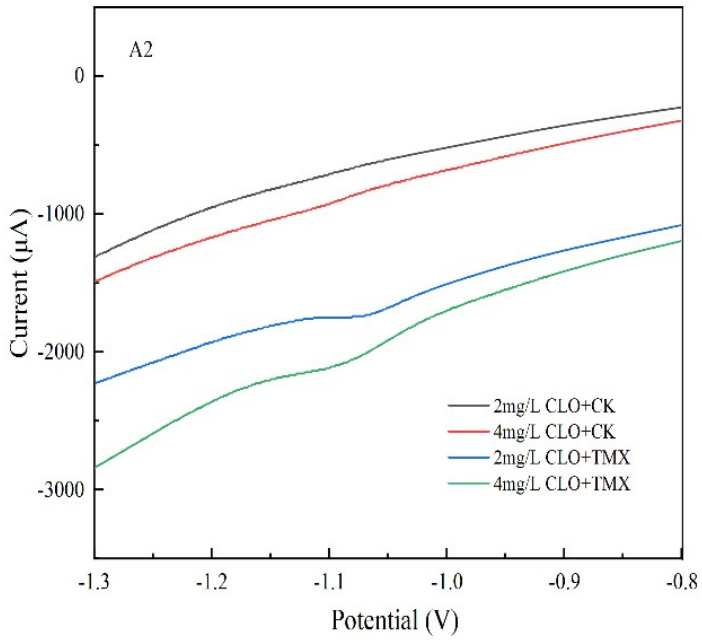


Fig. S5 Interference resistance of NF-LO/GPE to chlorogenic acid (CGA). The values are deviation rate relative to TMX.


A1
0
-1000
-2000
-3000
Current (μA)
-1.3
-1.2
-1.1
-1.0
-0.9
-0.8
Potential (V)
TMX
DNF+TMX
DLM+TMX
CLO+TMX


A2
0
-1000
-2000
-3000
Current (μA)
-1.3
-1.2
-1.1
-1.0
-0.9
-0.8
Potential (V)
2mg/L CLO+CK
4mg/L CLO+CK
2mg/L CLO+TMX
4mg/L CLO+TMX

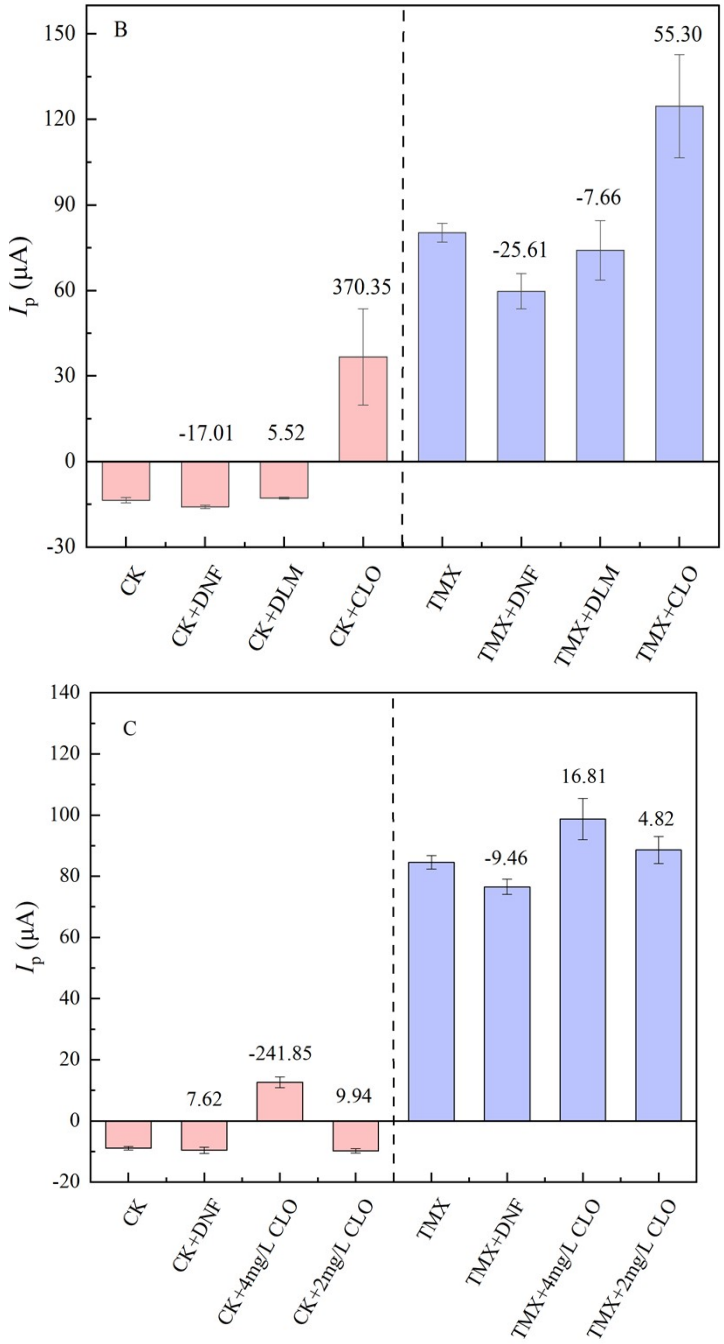


Fig. S6 (A1) The voltammograms of TMX and the co-occurring pesticides corresponding to the experimental group in Figure B. (A2) Interference of CLO after acidification. (B) Interference of pesticides without acidification treatment, (C) Interference of pesticides after acidification treatment. *the deviation rate (%)

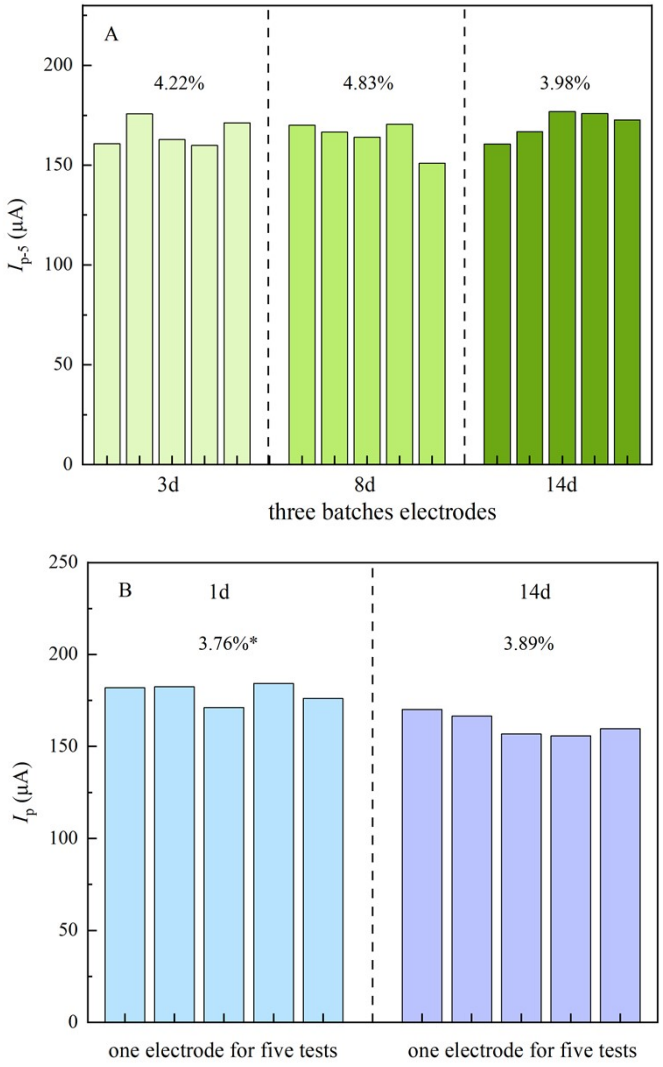


Fig. S7 Detection reproducibility, preparation reproducibility and storage stability of NF-LO/GPE. (A) Three batches prepared within 14d and five electrodes in each batch measured once. (B) Reproducibility of five repeated tests on one electrode. * deviation rate

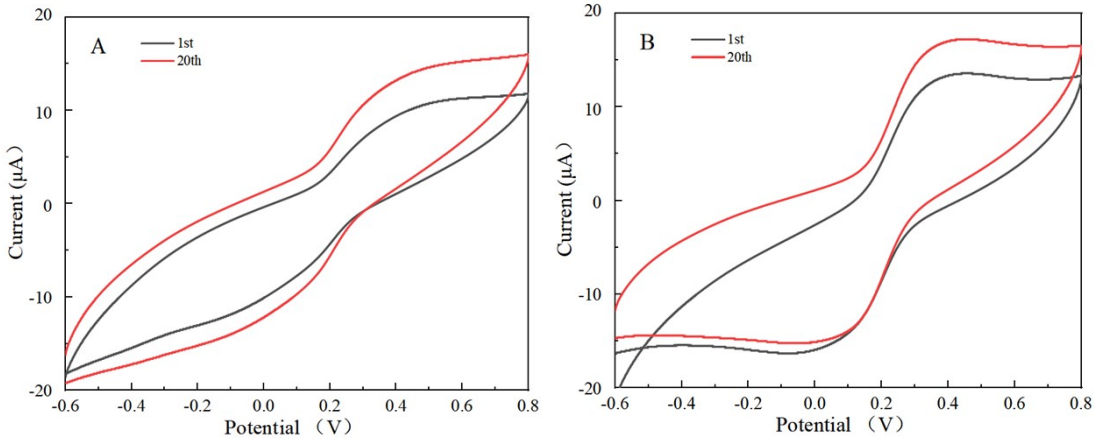


Fig. S8 Cyclic voltammograms of NF-LO/GPE (A) and GPE (B) in $K_3[Fe(CN)_6]$KCl

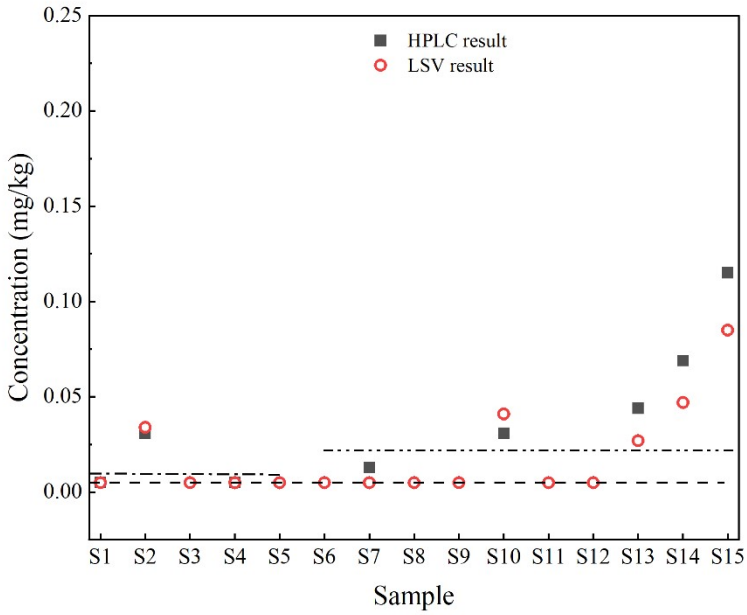


Fig. S9 Sample detection results with LSV and HPLC method. ND (not detected) is plotted in the figure at 1/2 LOD.