Electronic Supplementary Material (ESI) for RSC Advances.

Supporting information

An electrochemical aptasensor for lead ion detection based on catalytic hairpin assembly and porous carbon supported platinum as signal amplification

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Experimental

Apparatus and electrochemical measurement

Electrochemical impedance spectroscopy (EIS) and differential pulse voltammetry (DPV) measurements were carried out with a CHI 660D electrochemical workstation (Shanghai Chenhua Instrument, China). A conventional three-electrode system: a platinum wire as counter electrode, a saturated calomel as reference electrode and the modified Au electrode (AuE, Φ=3 mm)) as working electrode. The prepared electrochemical biosensor was performed by DPV in PBS (pH 7.4) containing 10 mM HQ and 10 mM H_2O_2. EIS measurement were carried out in 5 mL PBS solution (0.1 M, pH 7.4) containing 5.0 mM $[Fe(CN)_6]^{3-/4-}$ and 0.5 M KCl as redox probe with a potential range of 0.1Hz to 10kHz and a scan rate of 100 mV s^{-1}.

Analysis of the crystal structure of carbon materials are carried out using X-ray powder diffractometer (XRD, Bruker D8 Advance) from Bruker, Germany. Scanning electron microcopy (SEM, JSM-7610F JEOL, Japan) and Transmission electron microscopy (TEM, JEOL 2010F) are used to characterize the prepared samples.

Results and discussion

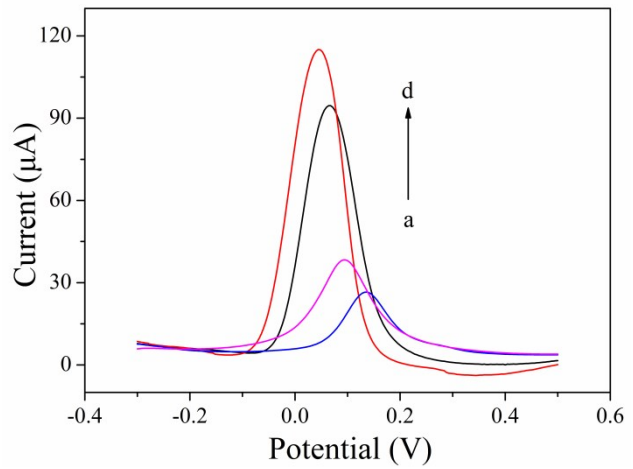

Fig.S1. DPV results of (a) bare electrode only containing HQ; (b) bare electrode containing HQ and H_2O_2; (c) PtNPs@PCs modified electrode only containing HQ; (d)

PtNPs@PCs modified electrode containing HQ and H_2O_2.

Table S1 Analytical performances of different electrochemical methods for Pb^{2+} detection

Method	Strategy	Linear range (nM)	LOD (nM)	Reference
SWASV	Au@PANI	20 to 720	3	1
DPASV	Au-CFs	100 to 2000	5	2
DPASV	MWCNT-PARS	24.1 to 724	2.27	3
SWASV	Fe_3O_4/MWCNTs/LSG	4.82 to 965.3	0.337	4
SWASV	AgNPs@p-1,8-DAN	1000 to 1200	0.15	5
DPV	ssDNAzyme	0.5 to 5000	0.25	6
EIS	OMC-GNPs	0.5 to 50000	0.2	7
EIS	AQMS	1 to 100	0.33	8
DPV	TdTase enzyme	0.05 to 500	0.043	9
DPV	AuNPs	0.6 to 50	0.312	10
DPV	CHA	0.04 to 3000	0.027	11
DPV	Fe-MOF&AuNPs	0.03 to 1000	0.02	12
DPV	PtNPs@PCs, CHA	0.05 to 1000	0.018	This work

References:

1 Z. W. Lu, W. L. Dai, B. C. Liu, G. Q. Mo, J. J. Zhang, J. P. Ye and J. S. Ye, *J. Colloid. Interface Sci.*, 2018, **525**, 86-96.

2 W. Xiong, L. Zhou and S. T. Liu, *Chem. Eng. J.* 2016, **284**, 650–656.

3 M. A. Chamjangali, S. Boroumand, G. Bagherian and N. Goudarzi, *Sens. Actuat. B.*, 2017, **253**, 124-136.

4 Z. W. Xu, X. K. Fan, Q. Y. Ma, B. Tang, Z. W. Lu, J. J. Zhang, G. Q. Mo, J. P. Ye and J. S. Ye, *Mater. Chem. Phys.*, 2019, **238**, 121877.

5 K. M. Hassan, G. M. Elhaddad and M. AbdelAzzem. *Microchim. Acta.*, 2019, **186**(7), 440.

6 Y. L. Zhang, S. X. Xiao, H. Z. Li, H. J. Liu, P. F. Pang, H. B. Wang, Z. Wu and W. R. Yang, *Sens. Actuat. B.*, 2016, **222**, 1083-1089.

7 Y. Y. Zhou, L. Tang, G. M. Zeng. C. Zhang, X. Xie, Y. Y. Liu, J. J. Wang, J. Tang, Y. Zhang and Y. C. Deng, *Talanta.*, 2016, **146**:641–647.

8 S. Xiao, L. C. Chen, X. L. Xiong, Q. L. Zhang, J. Feng, S. X. Deng and L. H. Zhou, *J. Electroana.l Chem.*, 2018, **827**, 175–180.

9 S. F. Liu, W. J. Wei, X. Y. Sun and L. Wang, *Biosens. Bioelectron.*, 2016, **83**, 33-38.

10 S. M. Taghdisi, N. M. Danesh, P. Lavaee, M. Ramezani and K. Abnous, *Sens. Actuat. B.*, 2016, **234**, 462-469.

11 X. Y. Huang, J. L. Li, Q. Y. Zhang, S. Chen, W. Xu, J. Y. Wu, W. C. Niu, J. J. Xue and C. R. Li, *J. Electroanal. Chem.*, 2018, **816**, 75-82.

12 X. Wang, C. L. Yang, S. J. Zhu, M. Yan, S. G. Ge and J. H. Yu, *Biosens. Bioelectron.*, 2017, **87**, 108-115.