Supporting Information

Nitrogen doped graphene nanosheets supported platinum nanoparticles as high performance electrochemical homocysteine biosensor

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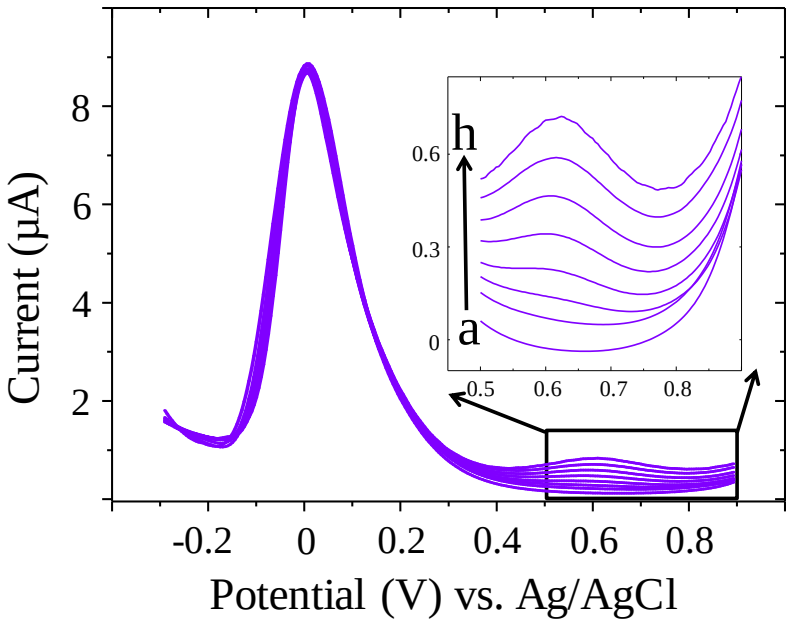

Fig. S1 DPVs for the oxidation of HCY at GNs/PtNPs modified GC electrode in different concentrations (a) 0, (b) 10, (c) 20, (d) 30, (e) 40, (f) 50, (g) 60, and (h) 70 µM in the presence of 0.2 mM of AA in 0.2 M PB solution. Pulse width = 0.05 s, amplitude = 0.05 V, sample period = 0.02 s and pulse period = 0.2 s.

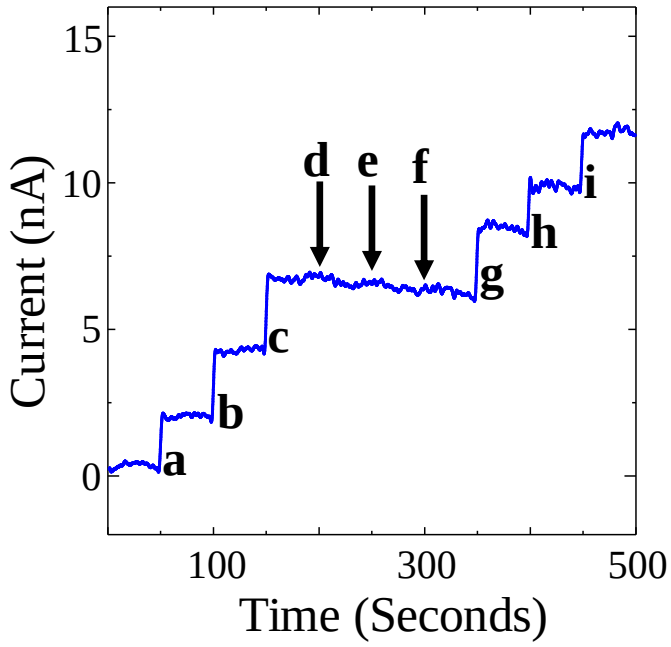

Fig. S2 Amperometric *i–t* curve responses (at a constant working potential of +0.60 V vs Ag/AgCl) obtained for 2 nM HCY (a, b and c) and 1 µM of dopamine (d), epinephrine (e) and L-dopa (f), then each addition was made for 2 nM HCY (g, h, and i) at N-GNs/PtNPs modified GC electrode in 0.2 M PB solution (pH=7.2) at a regular interval time of 50 s.

Table S1 Detection limit of HCY is obtained at different chemically modified electrodes vs. N-GNs/PtNPs nanocomposites modified electrode.

Modified Electrodes	**Detection Limit of HCY**	**References**
Carbon-nanotube paste (CNTP) electrode	4.6 µM	[1]
Fluorosurfactant (i.e. Zonyl FSO)-modified gold electrode	5 µM	[2]
Platinum/poly(methyl violet) (Pt/MV) chemically modified electrode	10 µM	[3]
Boron-doped diamond (BDD) thin film electrodes	1 nM	[4]
Colloidal gold-cysteamine-carbon paste electrode	30 nM	[5]
Carbon nanotube modified glassy carbon electrode	60 nM	[6]
Electropolymerized film of 2-amino-1,3,4-thiadiazole (p-ATD) modified glassy carbon electrode	100 nM	[7]
Nitrogen doped graphene supported Pt nanoparticles modified glassy carbon electrode	200 pM	This work

References

1. N. S. Lawrence, R. P. Deo and J. Wang, *Talanta*, 2004, **63**, 443-449.
2. Z. Chen and Y. Zu, *Journal of Electroanalytical Chemistry*, 2008, **624**, 9-13.
3. H. Xu, W. Zhang, W. Zhu, D. Wang, J. Ye, K. Yamamoto and L. Jin, *Analytica Chimica Acta*, 2005, **545**, 182-188.
4. O. Chailapakul, W. Siangproh, B. V. Sarada, C. Terashima, T. N. Rao, D. A. Tryk and A. Fujishima, *Analyst*, 2002, **127**, 1164-1168.
5. L. Agüí, C. Peña-Farfal, P. Yáñez-Sedeño and J. M. Pingarrón, *Talanta*, 2007, **74**, 412-420.
6. K. Gong, Y. Dong, S. Xiong, Y. Chen and L. Mao, *Biosensors and Bioelectronics*, 2004, **20**, 253-259.
7. P. Kalimuthu and S. A. John, *Bioelectrochemistry*, 2010, **79**, 168-172.

Table S2. Determination of HCY in human blood serum samples using N-GNs/PtNPs nanocomposite modified GC electrode[a]

	Blood Serum Sample 1	Blood Serum Sample 2	Blood Serum Sample 3	Blood Serum Sample 4
Original value (µM)	50.1 ± 0.1	50.0 ± 0.1	50.1 ± 0.1	50.1 ± 0.1
Spike (µM)	20	20	20	20
After spike (µM)	70.20 ± 0.1	70.10 ± 0.1	70.23 ± 0.1	70.28 ± 0.1
Recovery (%)	99.8%	99.8%	99.7%	99.6%

[a]*Four replicate measurements were made on the sample.*