Electronic Supplementary Material (ESI) for RSC Advances.

Facile and green synthesis of graphene oxide by electrical exfoliation of pencil graphite and gold nanoparticle for non-enzymatic simultaneous sensing of ascorbic acid, dopamine and uric acid

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Fig. S1. UV behaviors of the electrically exfoliated GO in PBS (PGO, curve a), HCl (HGO, curve b) and NaOH (NGO, curve c)

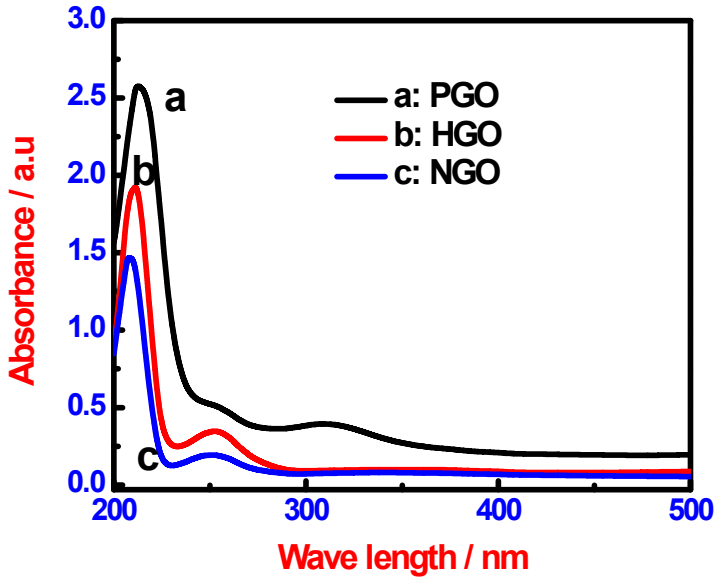

Fig. S2. Photo chemi luminescence behaviors of the electrically exfoliated GO in PBS (PGO, curve a), HCl (HGO, curve b) and NaOH (NGO, curve c)

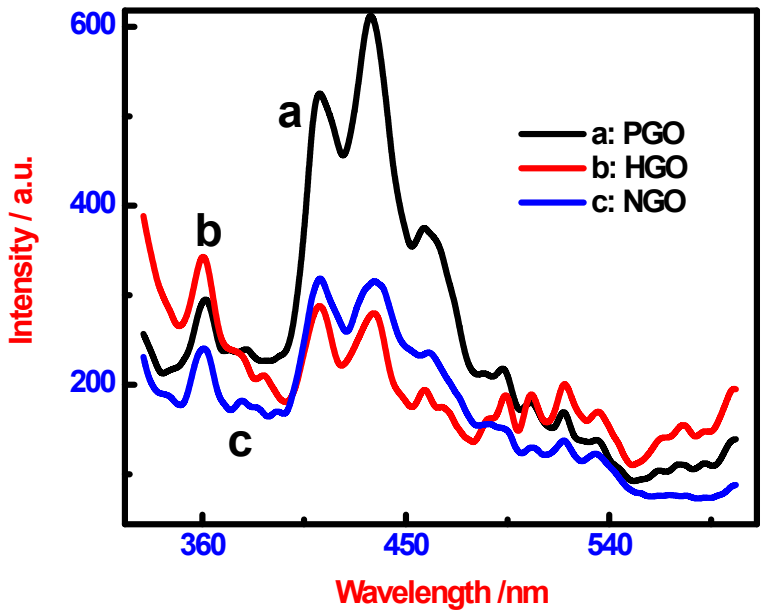

Fig. S3. Contact angles measured using contact angle goniometer for the electrically exfoliated GO. (a) PGO, (b) HGO and (c) NGO.

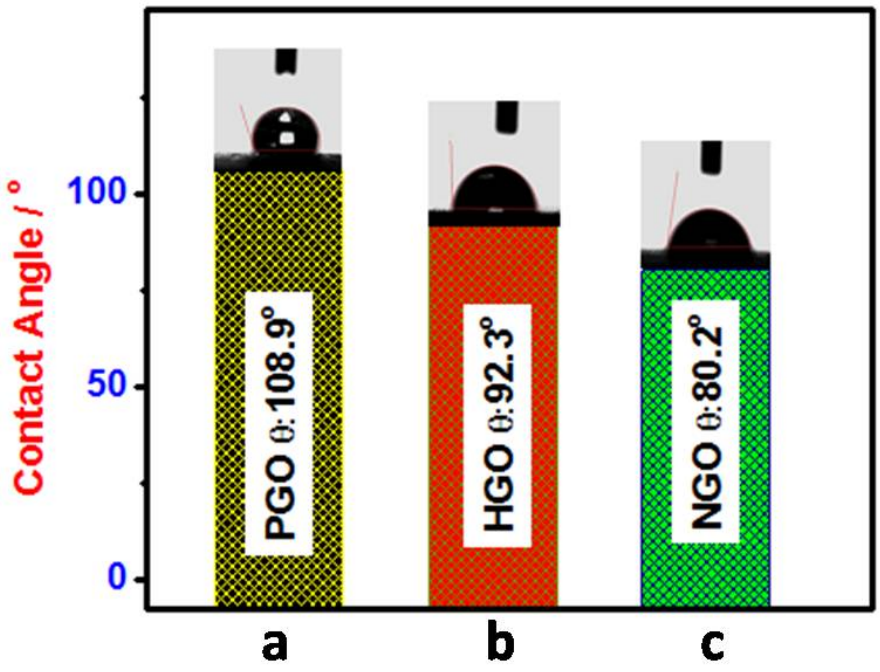

Fig. S4. Selective detection of AA (A), UA (B) and DA (C) using PGO-AuNP composite measured by DPV. Inset: Current *versus* concentration plots of the respective analytes. Error bars are included.

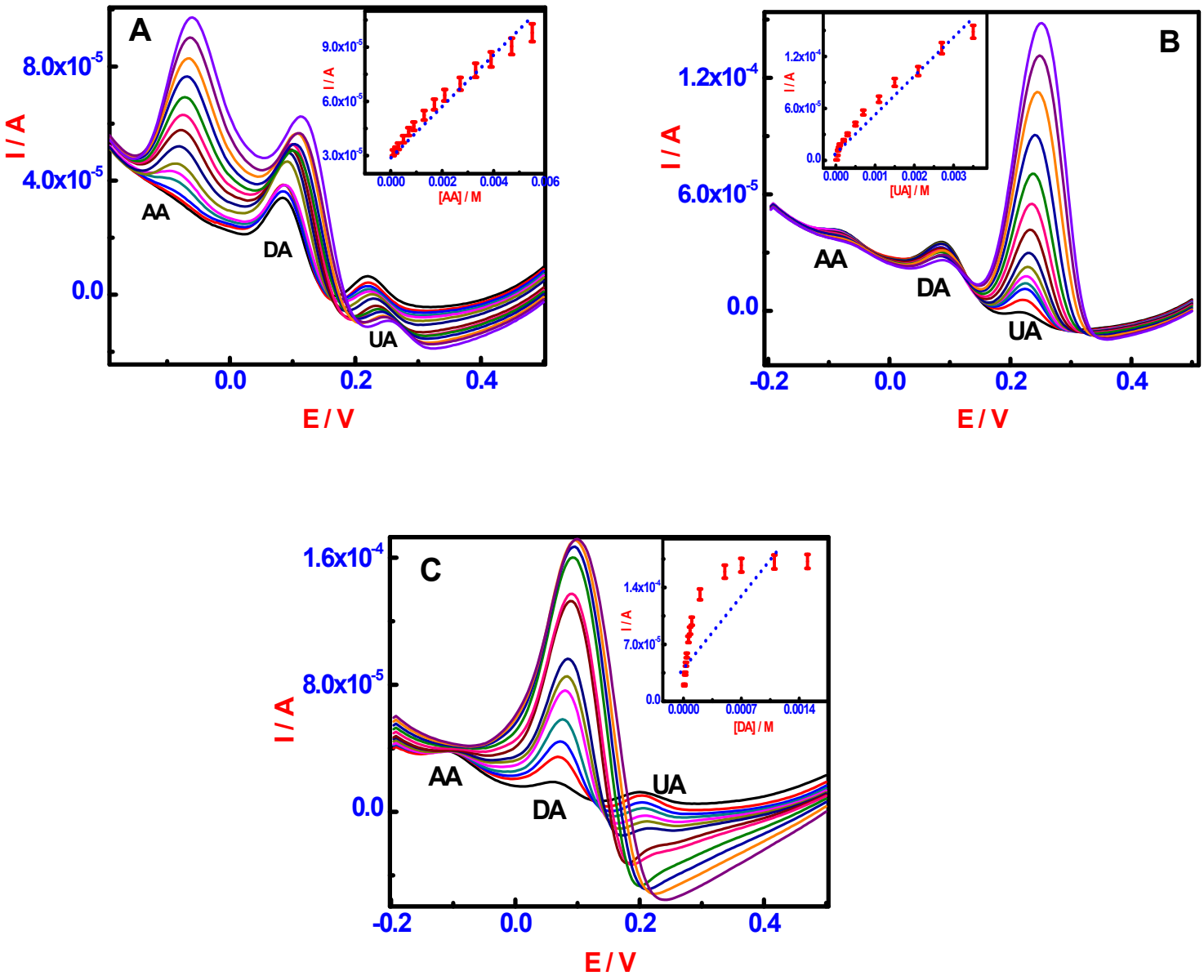

Fig. S5. Lineweaver-Burk plots for calculating the Michaelis-Menten kinetic parameter k_M for the GCE-PGO-AUNP (A-C) and GCE-PErGO-AuNP (D-F) for the analyte AA, UA and DA in phosphate buffer.

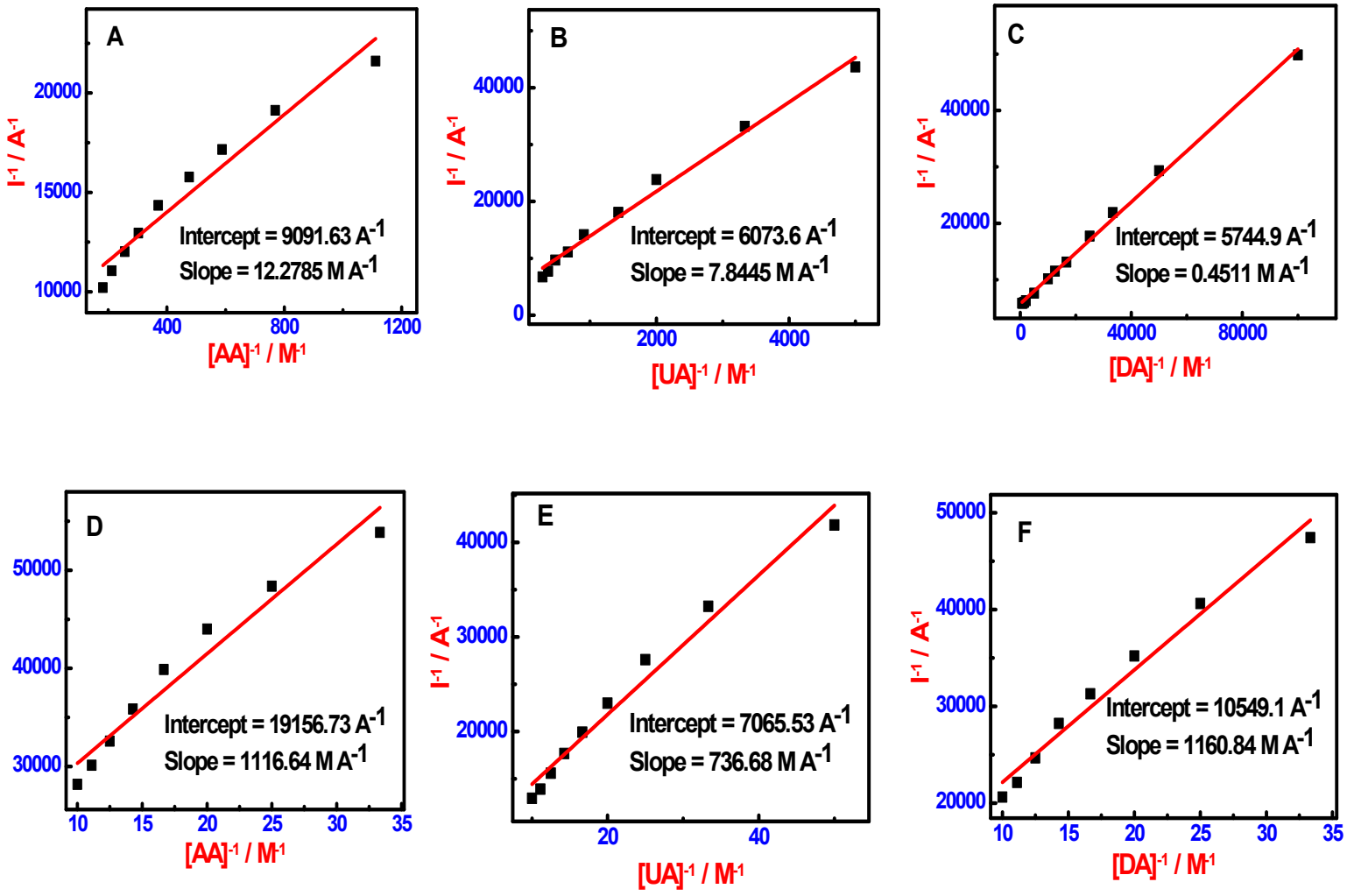

Fig. S6. Reproducibility detections of AA, UA and DA by differential pulse voltammetry

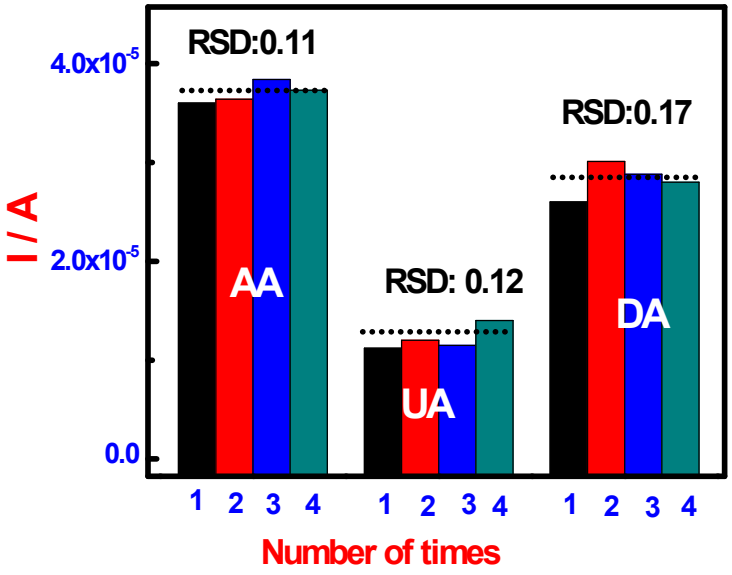

Table S1. Michaelis-Menten kinetic parameter k_M, linear ranges and lowest detection limits observed at the PGO-AuNP and PErGO-AuNP surfaces respectively for the AA, UA and DA in PBS buffer.

Parameter	Analyte	PGO-AuNP	PErGO-AuNP
K_M (mM)	AA	1.35	58
	UA	1.28	104
	DA	0.07	110
Linear range (µM)	AA	200 - 800	1 - 6000
	UA	20 - 260	2 - 7000
	DA	5 - 100	0.01 - 3000
Detection limit (µM)	AA	200	1
	UA	20	2
	DA	5	0.01

Table S2. Literature review of simultaneous determinations of AA, UA and DA at graphene oxide /metal or metal oxide modified electrodes.

S.No	Surface	Analyte	Detection limits	pH	References Number
1.	Au nanoparticles (NPs) and graphene oxide sheets (Au NP/GO) composites	AA	100 nM,	pH 7.4	1
2.	Iron oxide/graphene modified glassy carbon electrode (Fe3O4/rGO/GCE)	AA, and DA	1 mM and 0.5 µM	pH 6.5	2
3.	Graphene sheets and gold nanoparticles modified carbon fiber electrode (GE/Au/GE/CFE)	DA and UA	0.59µM and 12.6µM	pH 7.4	3
4.	Gold nanoparticles (AuNPs) and graphene nanosheets (GNS)	AA, DA and UA	1mM , 0.2mM and 0.2mM .	pH 7.0	4
5.	reduced graphene oxide-supported Au@Pd (Au@Pd-RGO) nanocomposites	AA, DA, and UA	0.28, 0.024, and 0.02µM	pH 7.0	5
6.	AuNPs / MoS2 nanocomposite	AA, DA and UA	50, 0.05 and 50 µM	pH 7.0	6
7.	Multi-walled carbon nanotube/Azure A/gold nanoparticle composites (Nafion/AuNPs/AzA/MWCNTs)	AA, DA, UA and tryptophan	300 µM, 0.5 µM, 0.5 µM and 1.0 µM,	pH 7.0	7
8.	reduced graphene oxide modified glassy carbon electrode (RGO-GCE)	AA, DA and UA,	4.2 µM, 8 nM and 0.6 µM,	pH 3.0	8
9.	screen-printed graphene electrode	AA, DA, and UA	0.95 , 0.12 and 0.20 µM	pH 7.0	9
10.	electrochemical reduction of graphene oxide (GO) attached through 1,6-hexadiamine on GCE	UA, xanthine (XN), hypoxanthine (HXN) and caffeine (CAF)	0.08 µM, 0.1 µM, 0.32 µM and 0.43 µM	pH 7.2	10
11.	Poly(methylene blue) / and electrochemically reduced graphene oxide composite film (PMB-ERGO/GCE)	UA and xanthine (Xa)	0.03 µM and 0.05 µM	pH 3.0	11
12.	Nitrogen doped graphene	AA, DA and UA	2.2 µM, 0.25 µM and 0.045 µM	pH 6.0	12
13.	Chitosan functionalized graphene	AA, DA and UA	50, 1.0 and 2.0 µM	pH 7.0	13
14.	Graphene oxide-templated polyaniline (GO-PAN) microsheets	AA, DA and UA	5, 5 and 10 µM	pH 7.4	15
15.	PErGO-AuNP	AA, DA and UA	1 µM, 10 nM, and 2 µM	pH 7.4	This Work

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