Electronic Supplementary Material (ESI) for Journal of Materials Chemistry B.

Supporting Information

Covalent Functionalization and Electrochemical Tuning of Reduced Graphene Oxide for the Bioelectrocatalytic Sensing of Serum Lactate

Bhaskar Manna and C. Retna Raj*

Functional Materials and Electrochemistry Laboratory, Department of Chemistry,

Indian Institute of Technology, Kharagpur 721302, West Bengal, India

*Corresponding author. Fax: +91 3222 282522

E-mail: crraj@chem.iitkgp.ernet.in

Figure S1

Possible mechanism involved in the grafting of nitrophenyl moiety onto rGO.

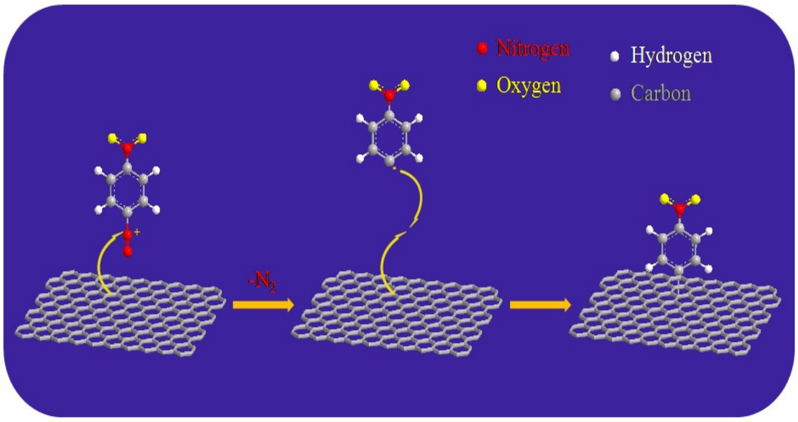


Figure S2: Raman spectral profile of GO (a), rGO (b) and rGO-$PhNO_2$ (c).

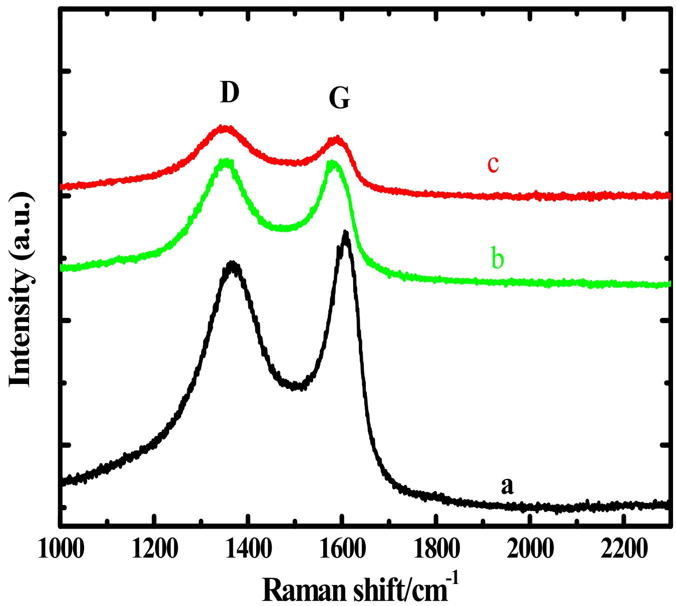


Figure S3: AFM images and height profiles of rGO **(A)** and rGO-$PhNO_2$**(B)**

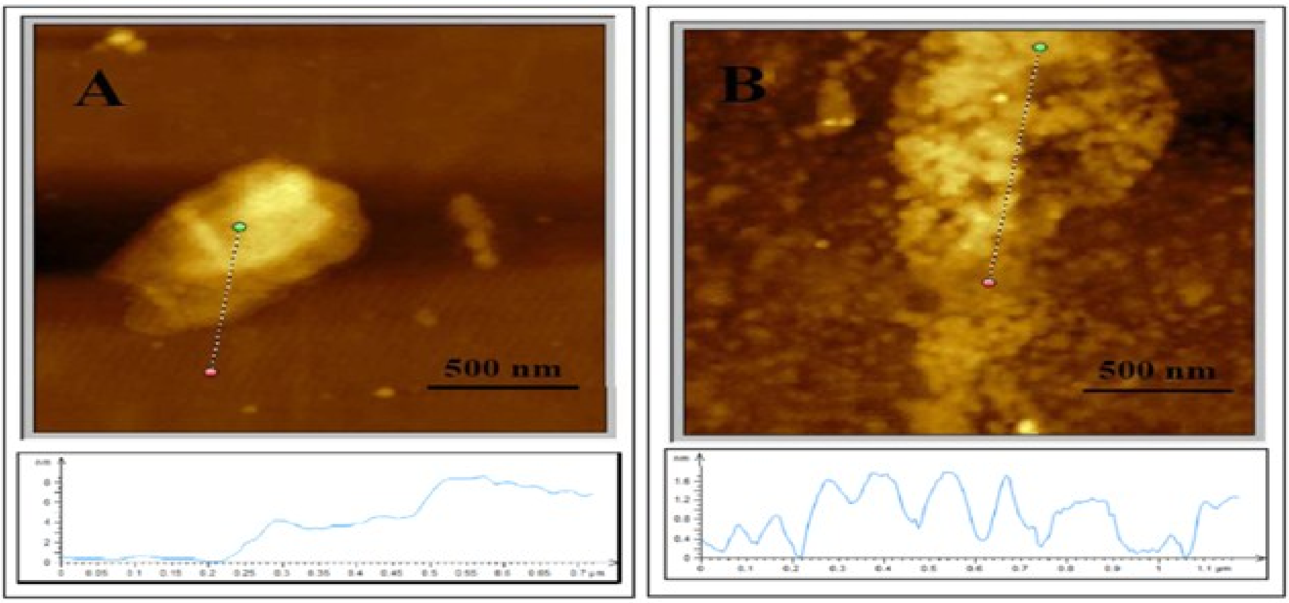
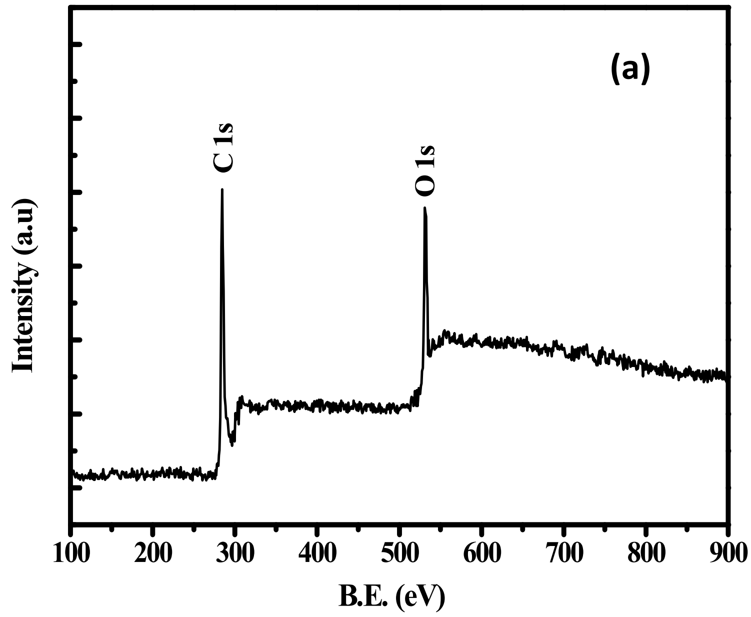


Figure S4: Surface survey XPS profile of (a) rGO and (b) GO.



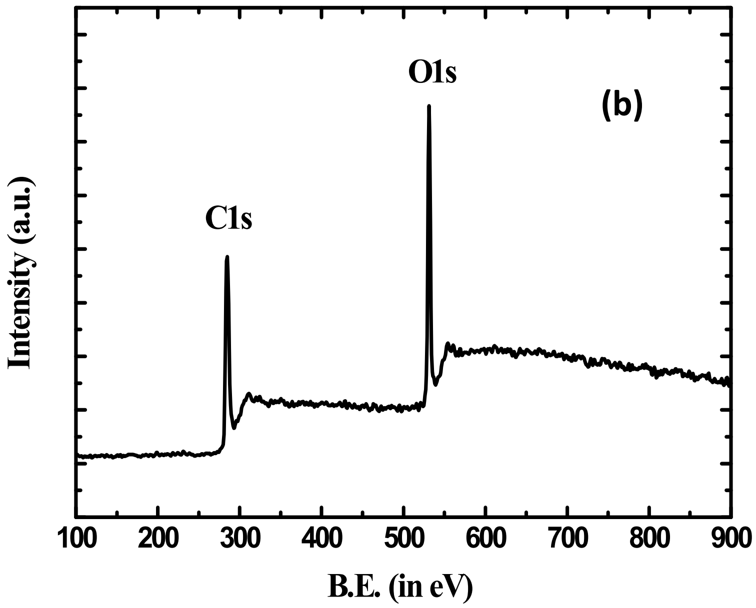


Figure S5: Cyclic voltammograms of rGO-PhNHOH modified GC electrode in 0.1 M PBS (pH 7.2) at different scan rates: (a) 2 (b) 5 (c) 10 (d) 15 (e) 20 (f) 25 (g) 30 and (h) 35 mVs^{-1}. Inset shows plot of peak current (i_p) vs scan rate.

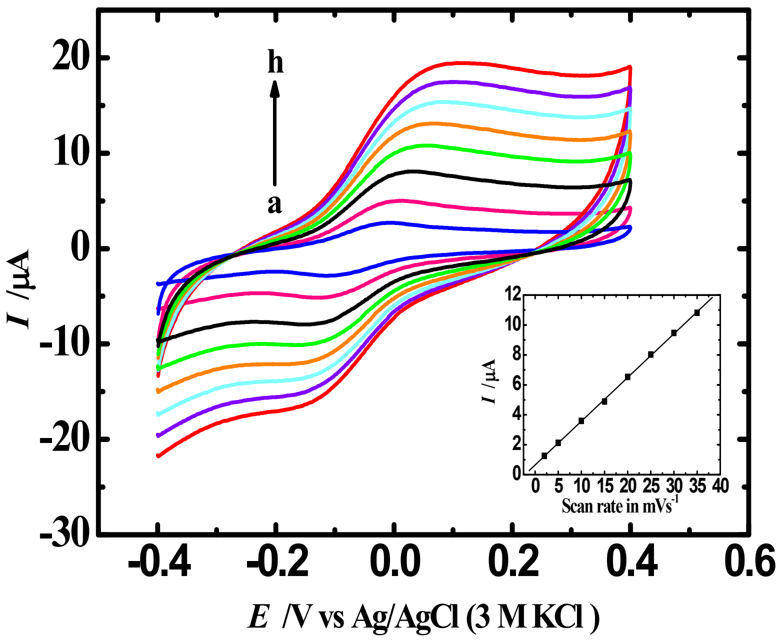


Figure S6: Cyclic voltammograms of rGO-PhNHOH modified GC electrode in 0.1 M PBS at various pH values: (a) 4, (b) 6, (c) 7, and (d) 8 at a scan rate of 10 mVs^{-1}. Inset shows plot of formal potential vs pH.

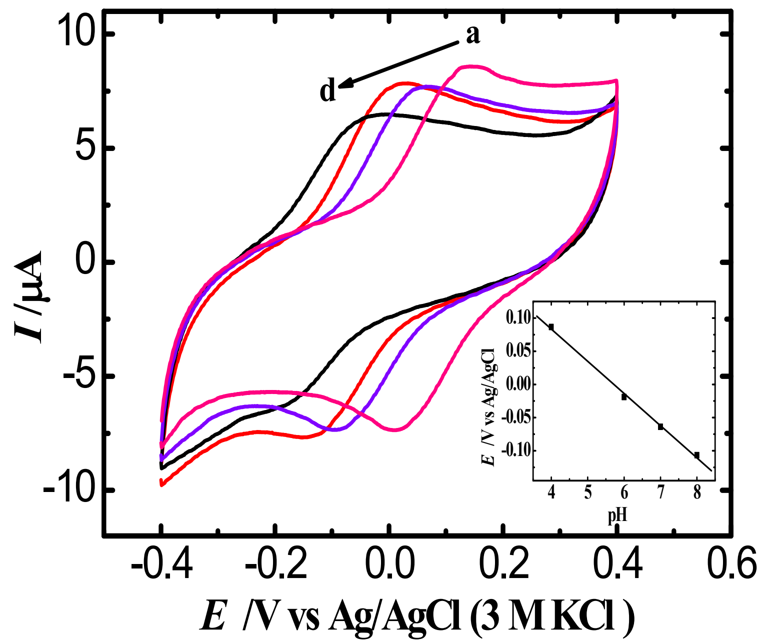


Figure S7: Electrochemical responses of rGO/GC electrode in the presence and absence of NADH in 0.1 M PBS (pH 7.2). Scan rate: 10 mVs^{-1}.

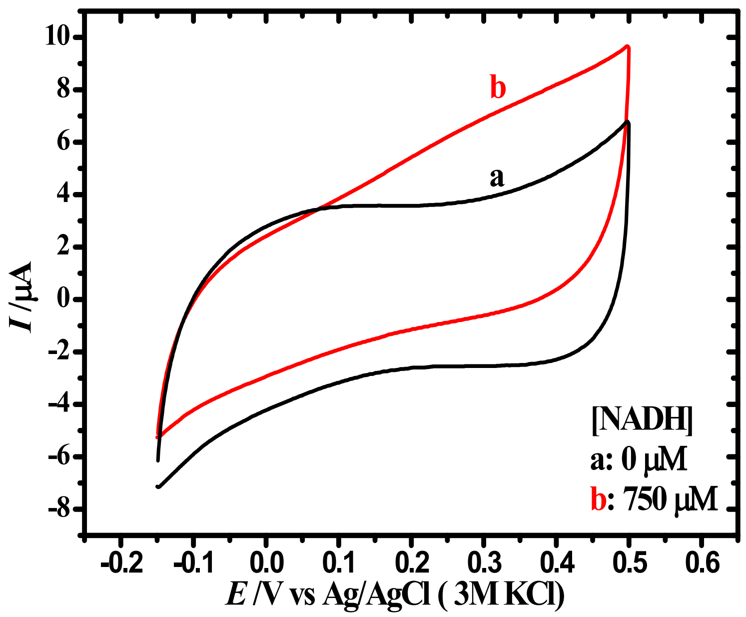


Figure S8: Amperometric i-t curve illustrating the operational stability of the rGO-PhNHOH modified GC electrode towards NADH measurement in 0.1 M PBS of pH 7.2. The electrode was polarised at 0.04 V and 100 μM NADH was injected.

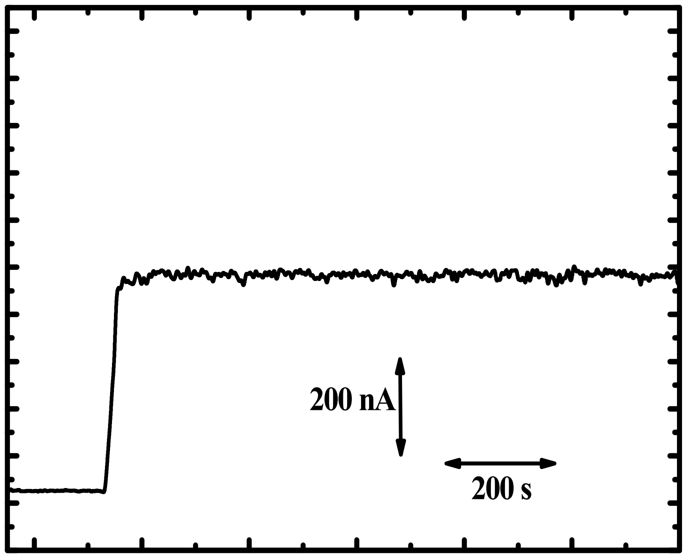


Figure S9: Amperometric i-t curve illustrating the interference effect of AA and UA for the sensing of NADH in 0.1 M PBS of pH 7.2. NADH, AA and UA (100 µM each) were injected one after another as indicated. The electrode was polarised at 0.04 V.

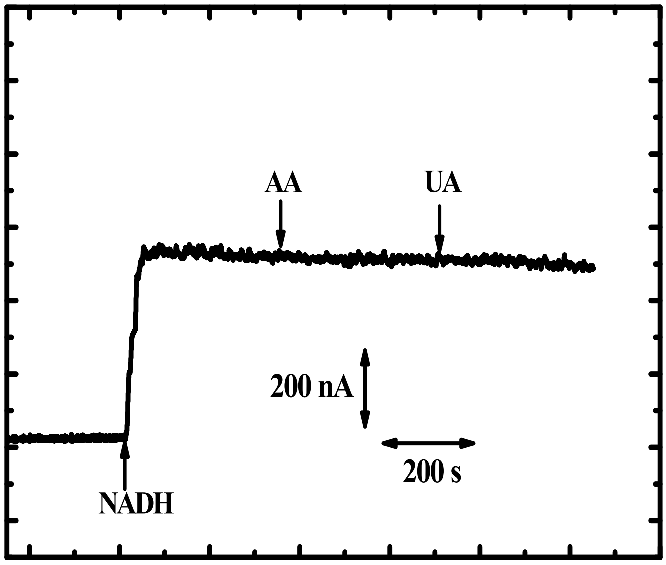


Figure S10: Plot illustrating the effect of NAD^+ concentration on the amperometric response of L-lactate biosensor. LDH loading: 5.2 U/μL; [L-lactate] = 50 μM; Electrolyte: 0.1 M PBS (pH 7.2); Electrode potential: 0.04 V.

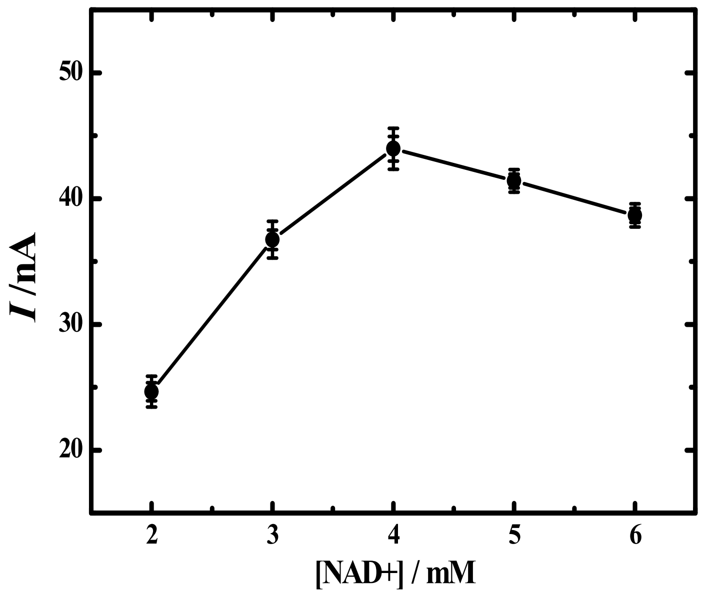


Table S1: Analytical performances of existing L-lactate biosensors.

Sl. No.	Sensing Interface	Detection potential in V	Linear range in µM	Limit of Detection (LOD) in µM	Sensitivity in nAµM^{-1}	K_M^{app} in mM	Reference
1	Poly-5,2′-5′,2″-terthiophene-3′-carboxylic acid/MWCNT	0.3 V vs Ag/AgCl	5-90	1.0	10.6	-	44
2	Polysulfone/CNT	0.05 V vs Ag/AgCl	1-20	0.37	7.3	-	45
3	SWCNT/Variamine blue	0.2 V vs Ag/AgCl	5-45	1.0	-	-	46
4	Fe_3O_4/ MWCNT composite	0.00 V vs Ag/AgCl	50-500	5.0	7.67	0.095	47
5	Multilayered graphene	0.25 V vs Ag/AgCl	30-600	19	-	-	48
7	MWCT-MB	0.00 V vs SCE	100-10000	7.5	0.42	-	49
9	Carbon spheres	0.15 V vs Ag/AgCl	0.5-12	3.7	4.1		50
10	MB/polysulfone-graphite	-0.10 V vs Ag/AgCl	1-12	0.87	80	0.050	51
11	RGO-AuNPs/SPCE	0.48 V vs Ag	10-5000	0.13	19.34	-	52

		pseudo reference electrode					
12	MWCNT-CHIT	0.6 V vs Ag/AgCl	5-120	0.76	0.58	0.24	53
	MBRS-SPCE	0.05 V vs Ag/AgCl	550-10000	550	0.0042	26.7	54
	Silica sol-gel/PVA/Au electrode	-0.22 V vs SCE	2-30	0.8	104	-	55
	Nano CeO_2/GCE	0.3 V vs Ag/AgCl	200-2000	50	571.19	1.536	56
	Nano ZnO/Au	0.468 V vs Ag/AgCl	0.2-0.8	4.73×10^{-3}	183.2	0.38×10^{-3}	57
13	rGO-PhNHOH	0.04 V vs Ag/AgCl	0-90	2.5	0.74	0.086	This work