A novel glucose sensor using lutetium phthalocyanine as redox mediator in reduced graphene oxide conducting polymer multifunctional hydrogel

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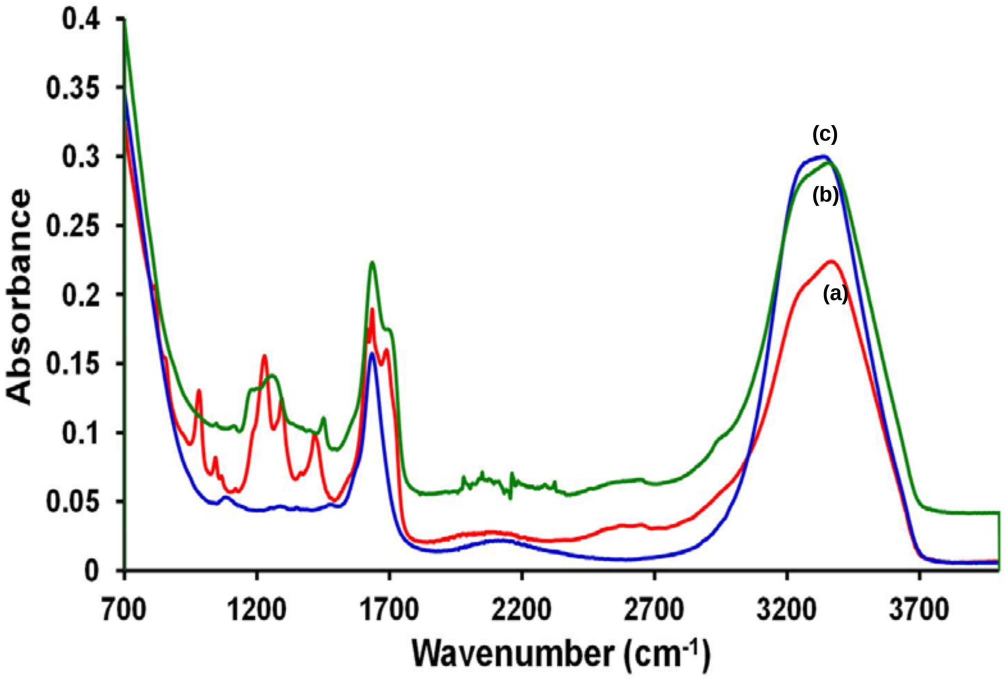
Supporting Information (SI)

SI-1

Table 1. UV-Visible absorption data for MFH and $LuPc_2$ thin films

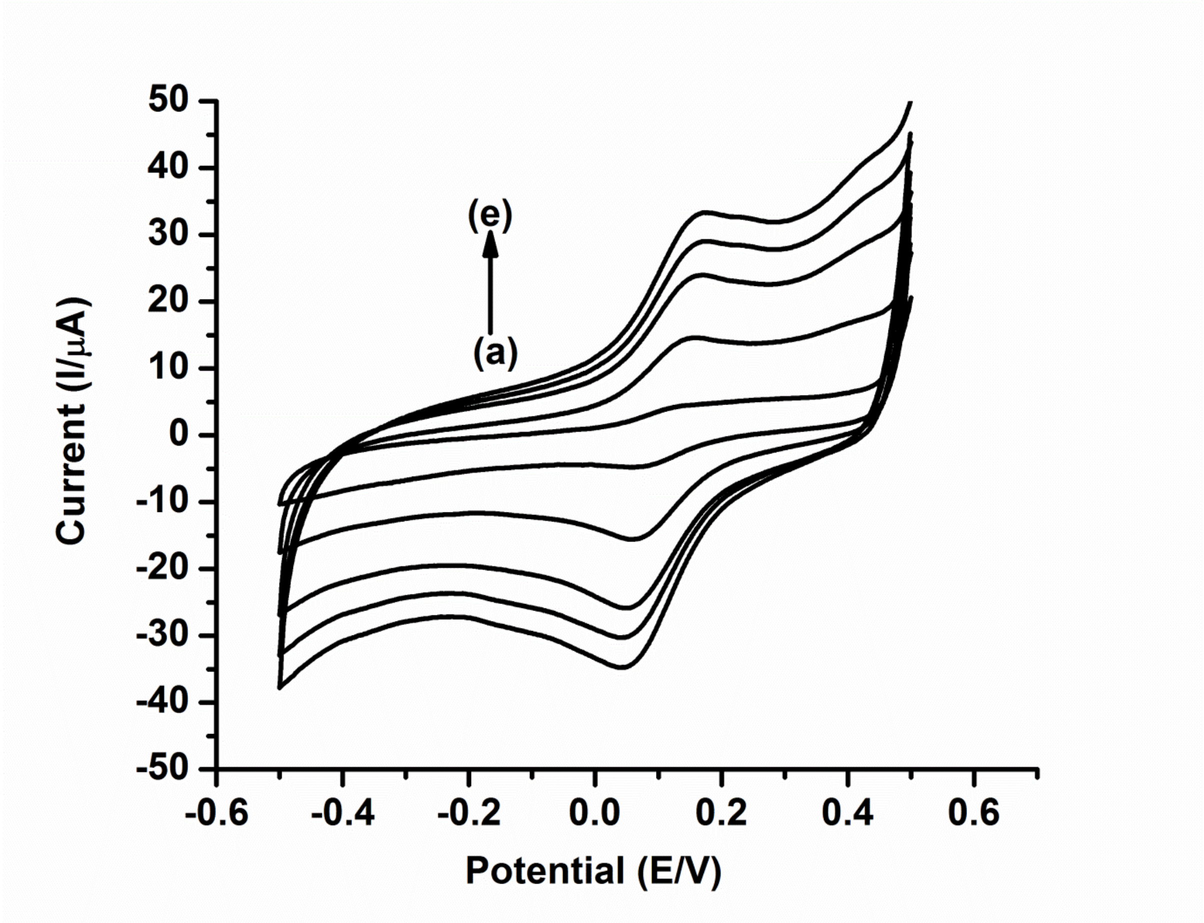
Sample	N (nm)	B (nm)	Benzenoid to quinoid transitions (nm)	π-radical (nm)	Q (nm)	RV (nm)
$LuPc_2$	317	390	-	543	706	938
PAA-rGO/VS-PANI/$LuPc_2$	-	342	430	546	712	-
PAA/VS-PANI/$LuPc_2$	-	356	432	543	702	-
PAA-rGO/$LuPc_2$	-	385	-	559	718	-

SI-2

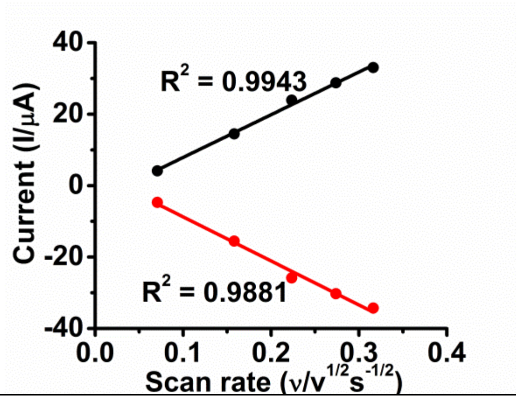


FTIR spectra of (a) PAA-rGO/VS-PANI/$LuPc_2$-MFH, (b) PAA/VS-PANI/$LuPc_2$-MFH, (c) PAA-rGO/$LuPc_2$ -MFH.

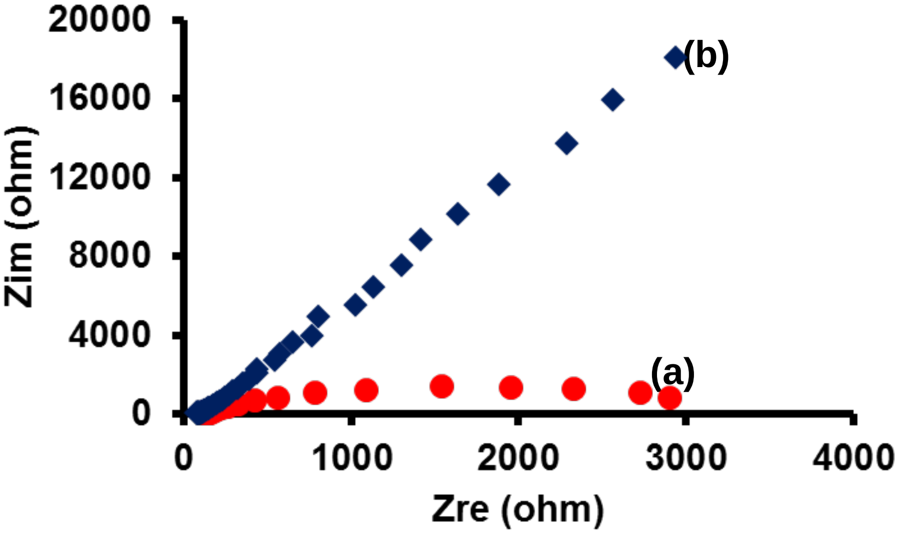
SI-3



Cyclic voltammograms (CVs) of PAA-rGO/VS-PANI/$LuPc_2$/GOx-MFH in 5 mM of $Fe(CN)_6^{3-/4-}$ containing 0.1 M NaCl for different scan rates (a–e); 5-100 mVs^{-1}; (Inset) Dependence of peak current on scan rates.

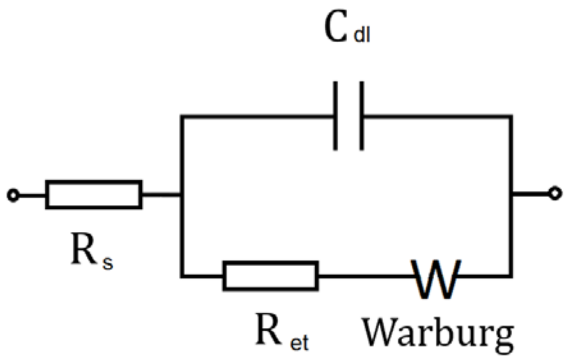


SI-4A



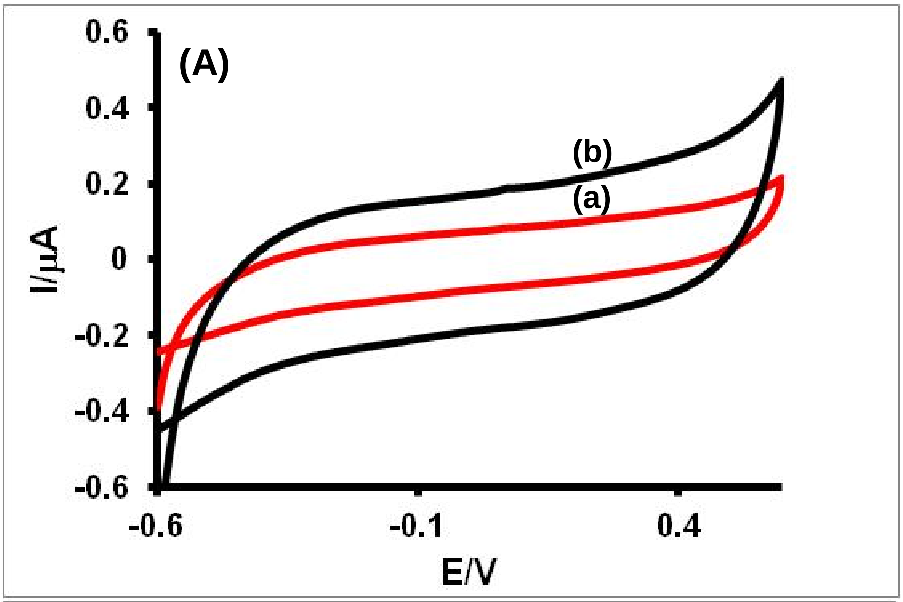
Nyquist plots (Z_{im} vs. Z_{re}) of PAA-rGO/VS-PANI/$LuPc_2$/GOx-MFH (a) and PAA/VS-PANI/$LuPc_2$/GOx-MFH (b) in the presence of PBS containing 0.1M NaCl

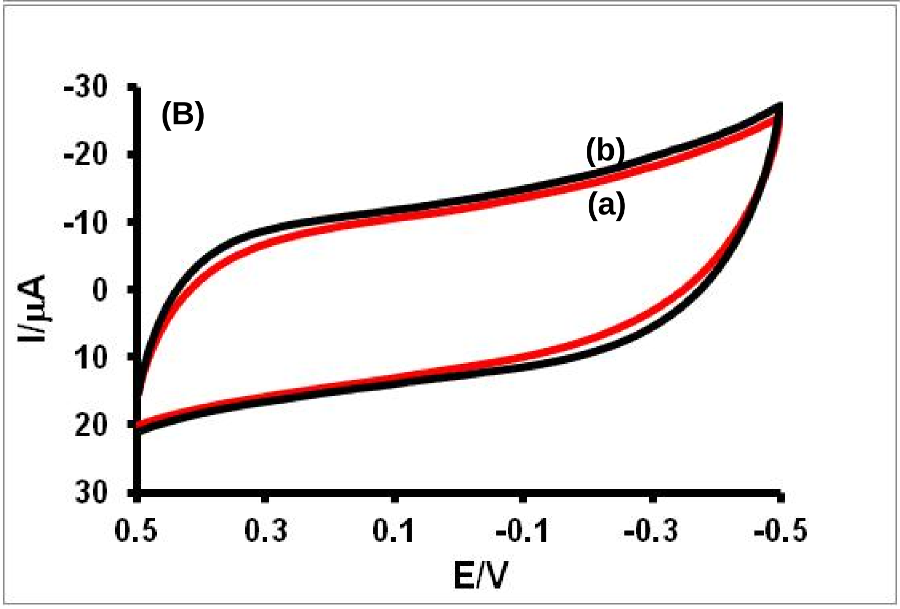
SI-4B



Equivalent circuit model for the fabricated biosensor where R_s: the uncompensated solution resistance; R_{et} is the electron transfer resistance; Warburg diffusion element (W) and C_{dl} is the double layer capacitance. Based on the model, good agreement was achieved over the frequency range 10 Hz and 2MHz between the simulated and experimental results

SI-5





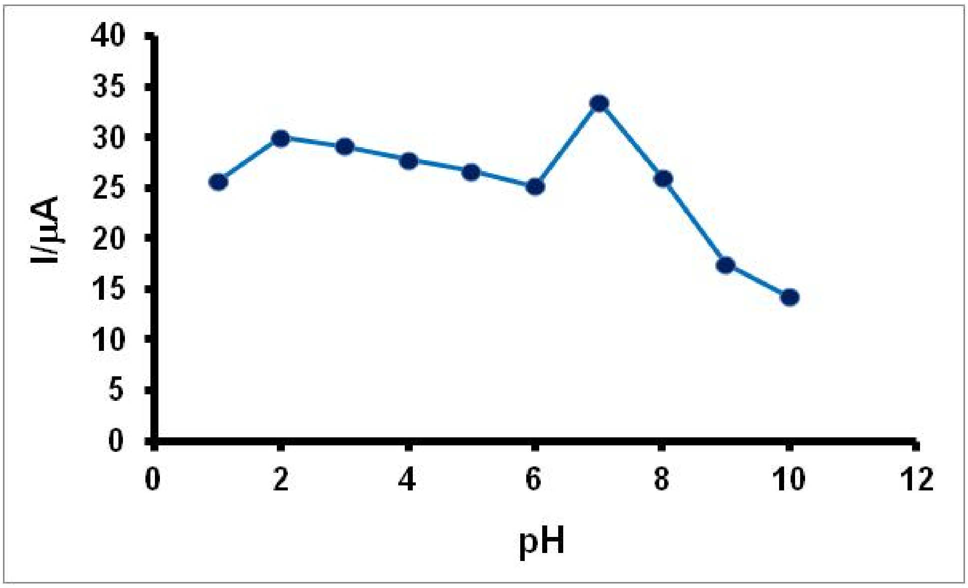
Cyclic voltammogram of (A) PAA/VS-PANI/$LuPc_2$/GOx-MFH, (B) PAA-rGO/$LuPc_2$/GOx-MFH for (a) 0 mM glucose (b) 4 mM glucose in 0.1M PBS (pH 7.0)

SI-6

Optimisation of PAA-rGO/VS-PANI/LuPc$_2$/GOx-MFH biosensor performance

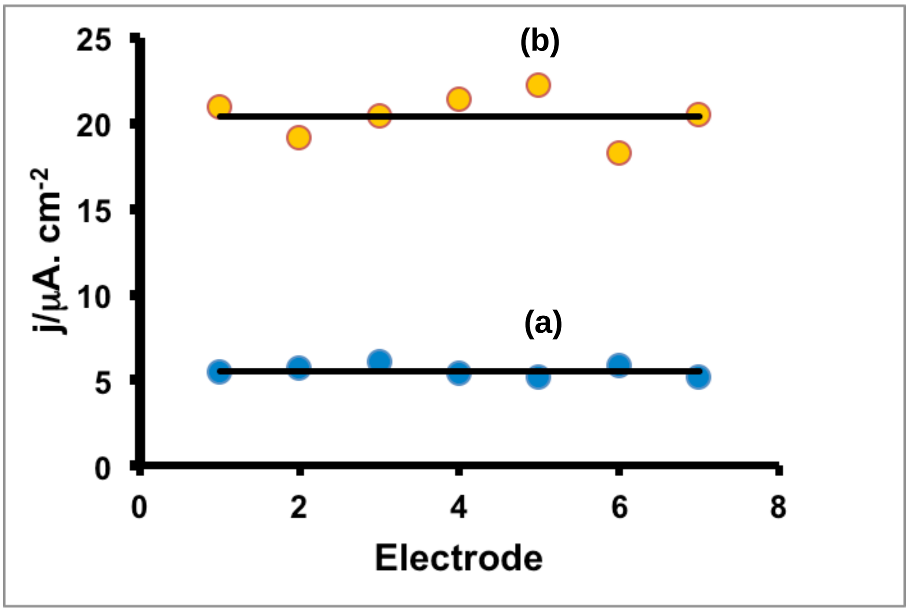
Optimisation studies were performed with the PAA-rGO/VS-PANI/LuPc$_2$/GOx-MFH biosensor in stirred solution was found to be dependent on pH. Fig. SI-5 shows the effect of pH on the oxidation current of glucose at the PAA-rGO/VS-PANI/LuPc$_2$/GOx-MFH biosensor. Initially the current value rises at pH 2.0 and then found to be decreased; later at around pH 7.0, the oxidation current increases steeply, then reaches a maximum value. Hence 0.1 M PBS (pH 7.0) is chosen as a medium buffer for further determination of glucose.

The effect of potential on the steady-state current for the PAA-rGO/VS-PANI/LuPc$_2$/GOx-MFH biosensor is studied. The applied potential of +0.3 V to +0.6 V in 0.1 M PBS (pH 7.0) does not show significant variation in the response current of glucose and hence +0.3 V is chosen as the applied potential for amperometric detection of glucose concentration.



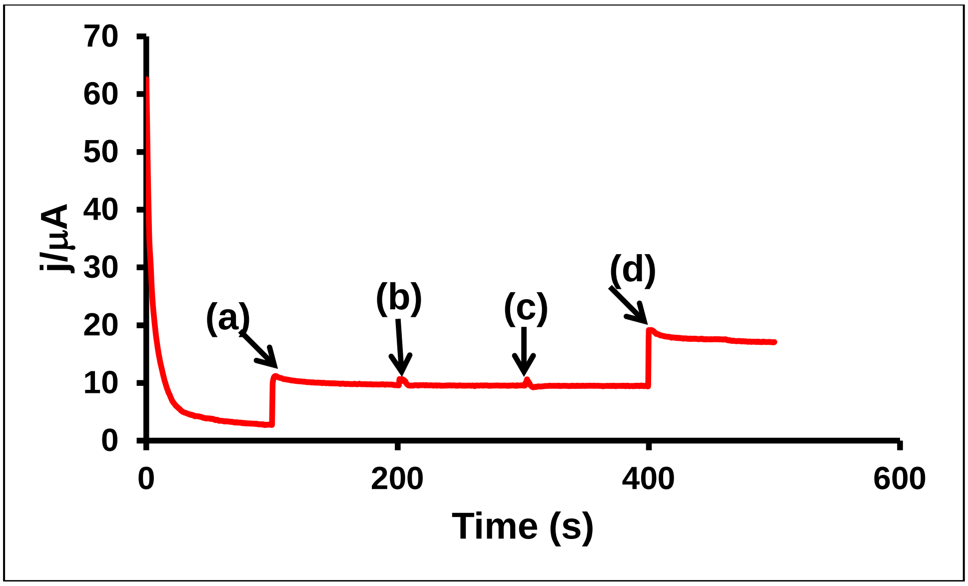
Effect of pH on the current response of glucose at PAA-rGO/VS-PANI/LuPc$_2$/GOx-MFH biosensor

SI-7



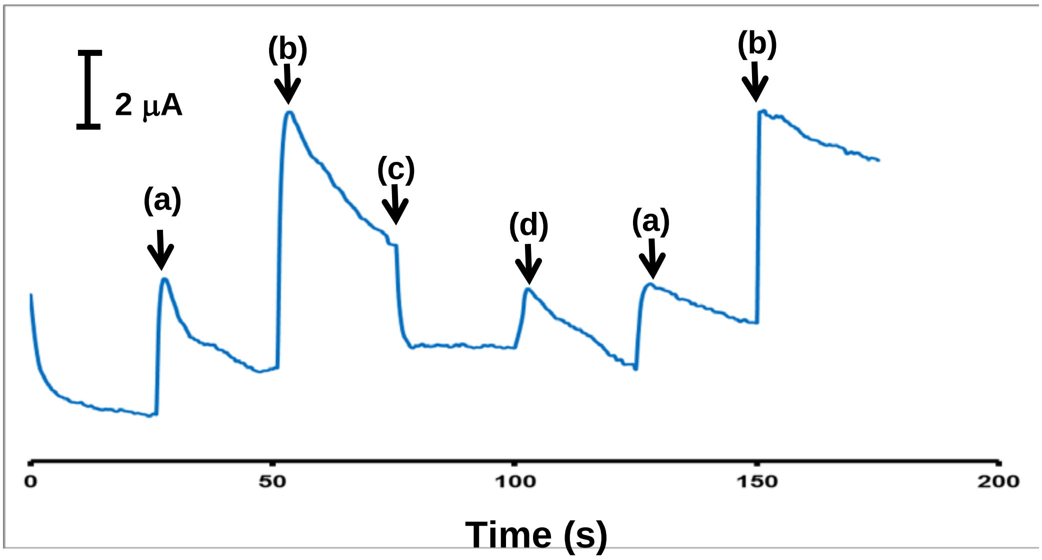
Amperometric response of (a) 4 mM (b) 6 mM at PAA/VS-PANI/$LuPc_2$/GOx-MFH biosensor (repetitive measurements)

SI-8



Amperometric response of (a) glucose (4 mM); (b) ascorbic acid (0.1 mM); (c) uric acid (0.5 mM); (d) glucose (4 mM) at PAA/VS-PANI/$LuPc_2$/GOx-MFH biosensor (Interference measurement)

SI-9



Amperometric responses of real samples (a) glucose, (b) juice 1, (c) juice 2, (d) human serum, at PAA/VS-PANI/$LuPc_2$/GOx-MFH biosensor at an applied potential of +0.3 V.

Table 2. Amperometric responses of real samples

Real samples	Added (according to specification in the label) (mM)	Found (mM)	Recovery (%)
Glucose	4	4.13	103.25
Juice 1	7.5	7.78	103.76
Juice 2	2.5	2.44	97.6
Human serum	-	3.86	-