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

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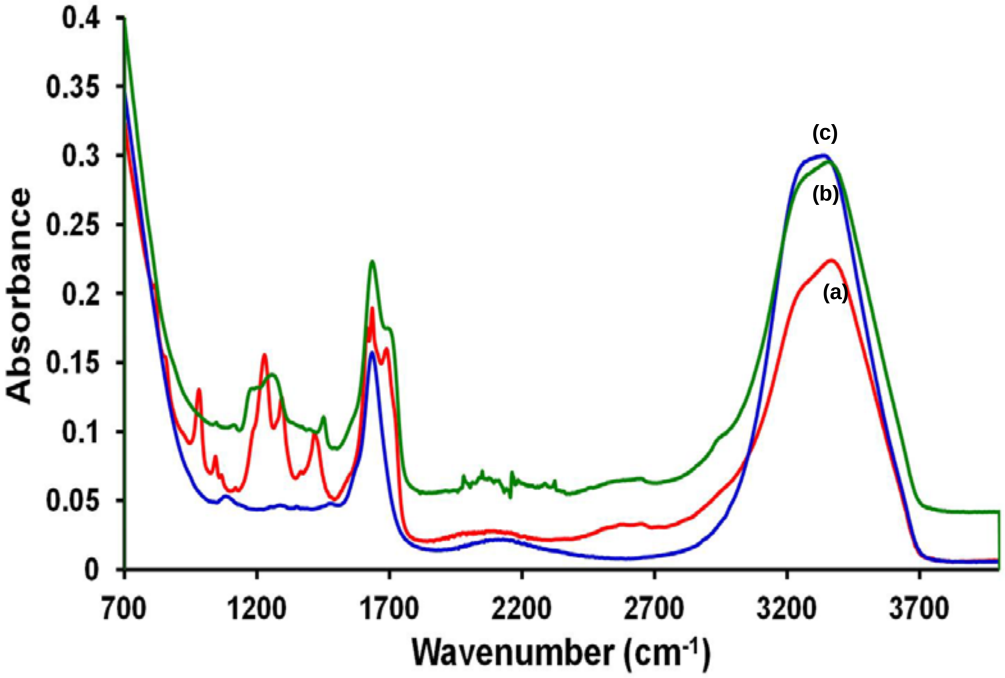
**Supporting Information (SI)**

**SI-1**

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

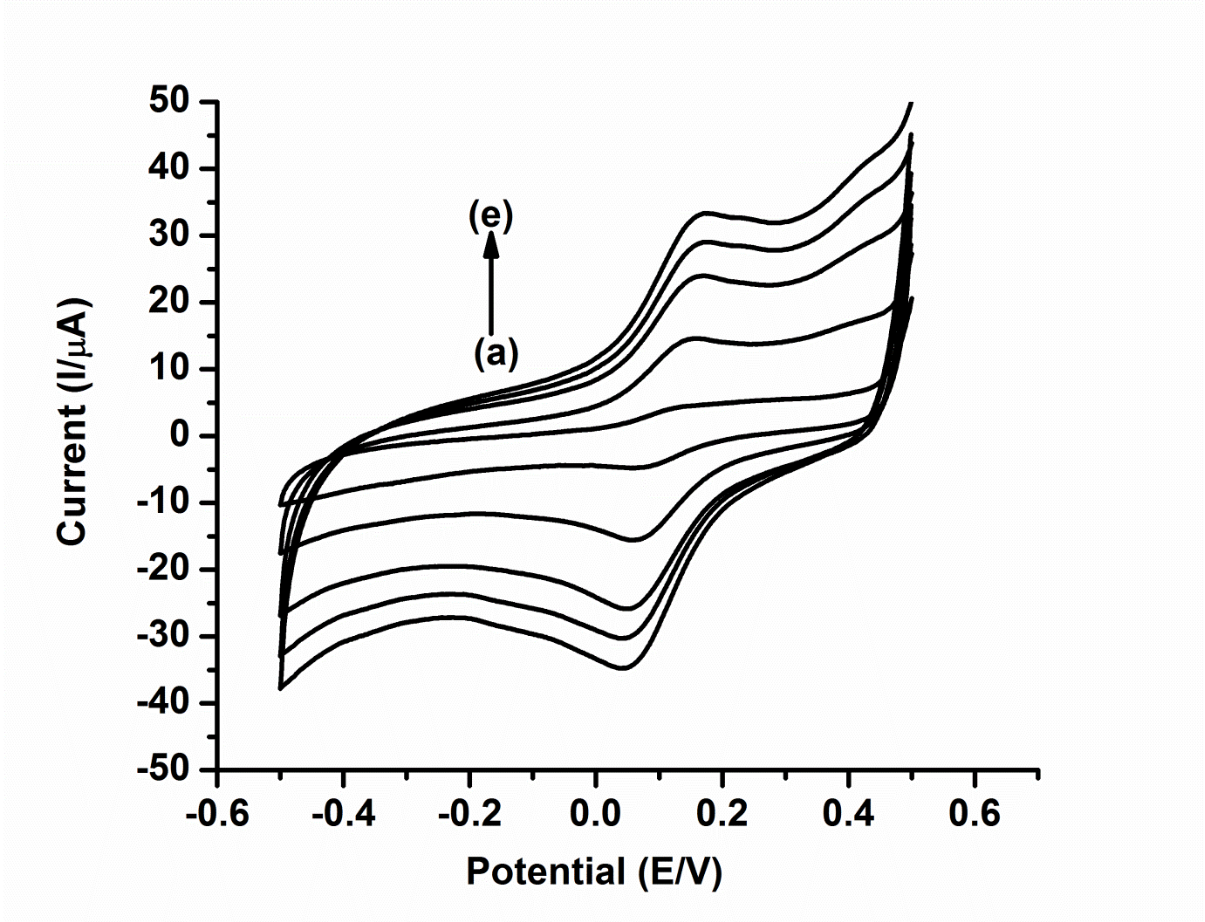
| **Sample** | **N (nm)** | **B (nm)** | **Benzenoid to quinoid transitions (nm)** | **π-radical (nm)** | **Q (nm)** | **RV (nm)** |
|---|---|---|---|---|---|---|
| $LuPc_2$ | 317 | 390 | - | 543 | 706 | 938 |
| PAA-rGO/VS-PANI/$LuPc_2$ | - | 342 | 430 | 546 | 712 | - |
| PAA/VS-PANI/$LuPc_2$ | - | 356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

**SI-2**

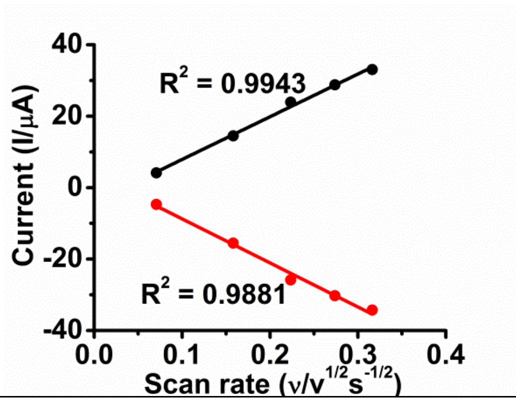



FTIR spectra of (a) PAA-rGO/VS-PANI/$LuPc_2$-MFH, (b) PAA/VS-PANI/$LuPc_2$-MFH, (c) PAA-rGO/$LuPc_2$ -MFH.

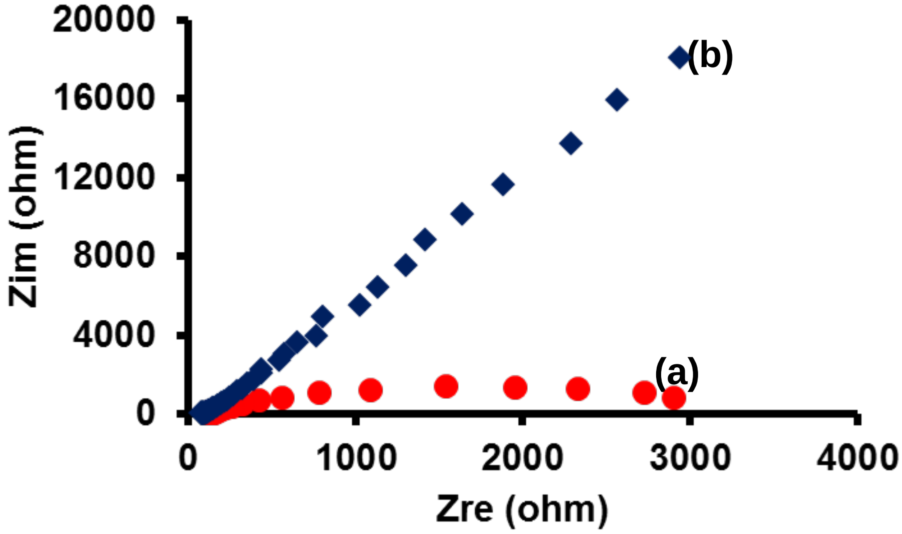
**SI-3**




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.

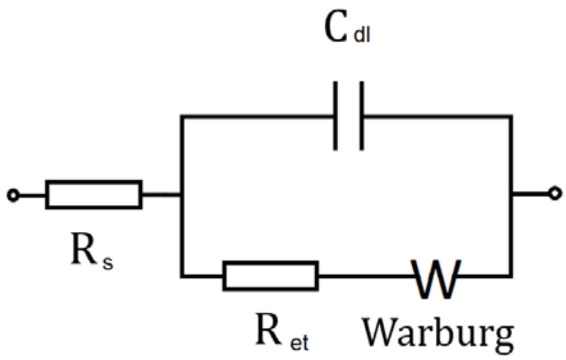


**SI-4A**



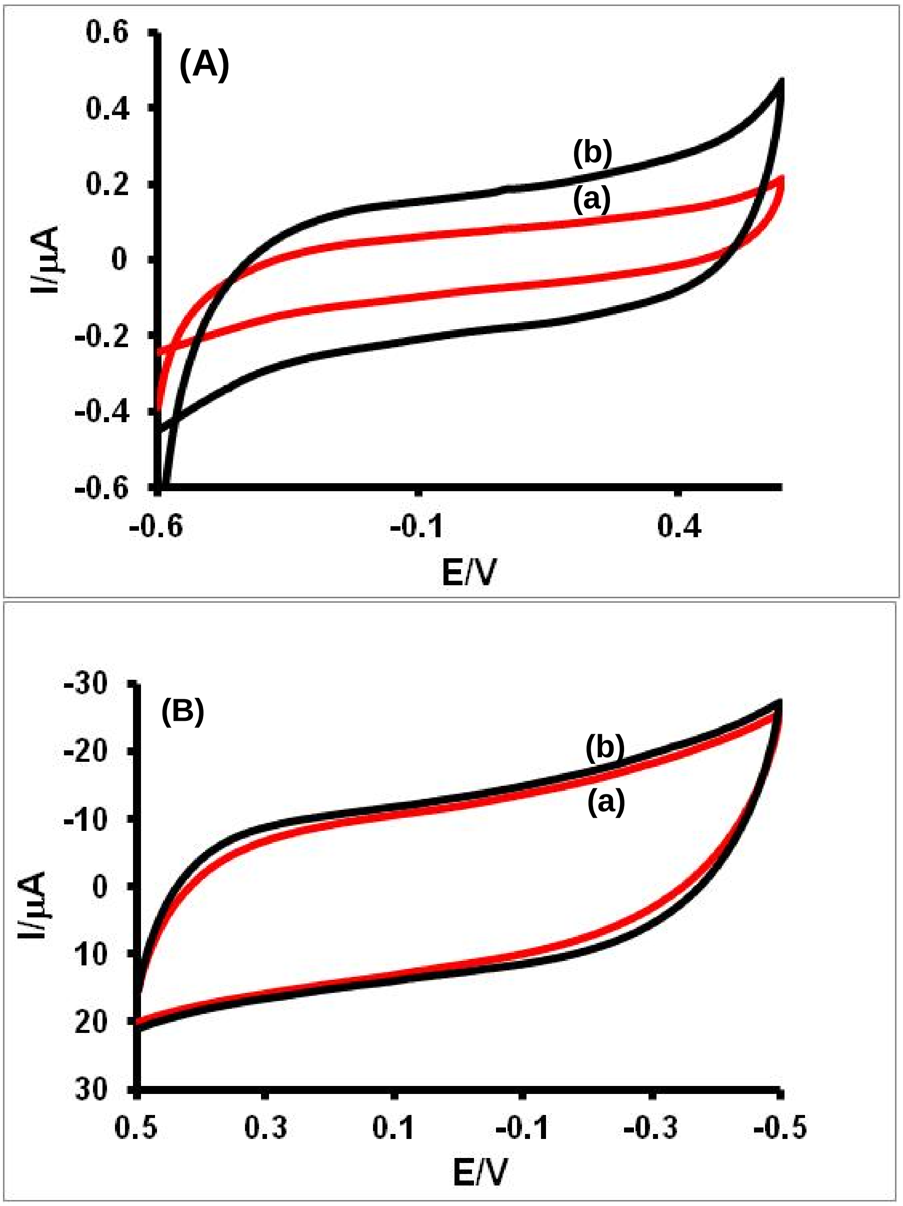

Nyquist plots ($Z_{im}$ vs. $Z_{re}$) of PAA-rGO/VS-PANI/$LuPc_2$/GOx-MFH (a) and PAA/VS-PANI/$LuPc_2$/GOx-MFH (b) in the presence of PBS containing 0.1M NaCl

**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**



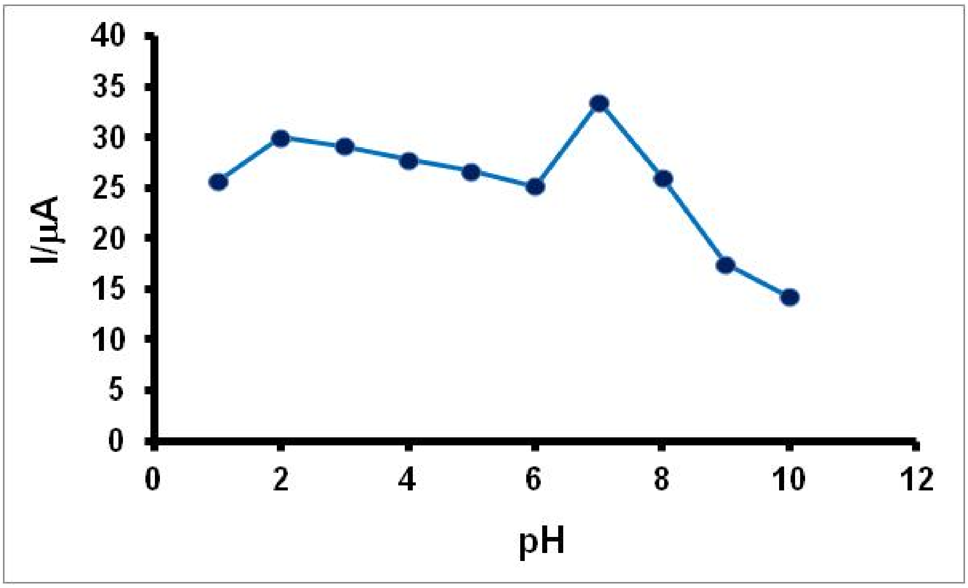

Cyclic voltammogram of (A) PAA/VS-PANI/$LuPc_2$/GOx-MFH, (B) PAA-rGO/$LuPc_2$/GOx-MFH for (a) 0 mM glucose (b) 4 mM glucose in 0.1M PBS (pH 7.0)

**SI-6**

**Optimisation of PAA-rGO/VS-PANI/$LuPc_2$/GOx-MFH biosensor performance**

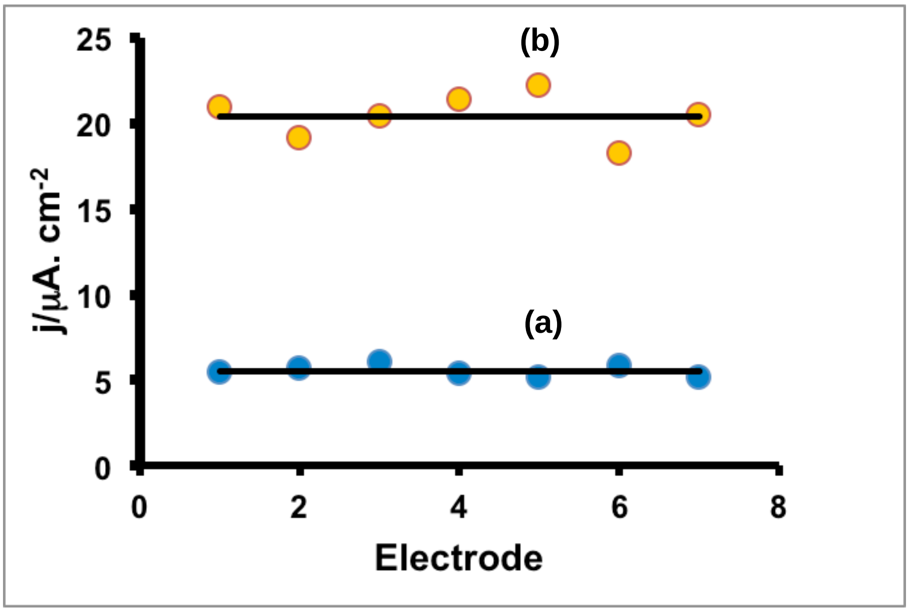
Optimisation studies were performed with the PAA-rGO/VS-PANI/$LuPc_2$/GOx-MFH biosensor in stirred solution was found to be dependent on pH. Fig. SI-5 shows the effect of pH on the oxidation current of glucose at the PAA-rGO/VS-PANI/$LuPc_2$/GOx-MFH biosensor. Initially the current value rises at pH 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.



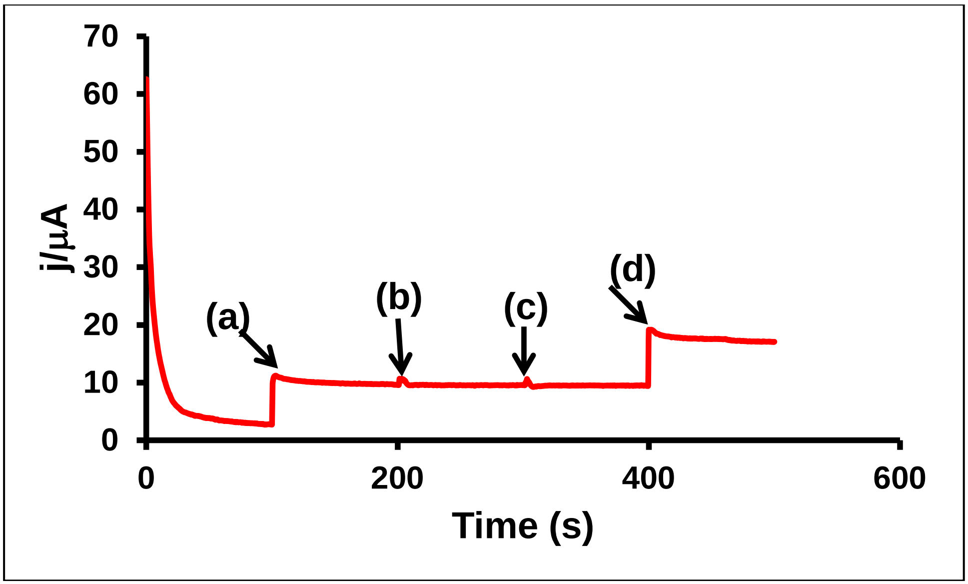

Effect of pH on the current response of glucose at PAA-rGO/VS-PANI/$LuPc_2$/GOx-MFH biosensor

**SI-7**



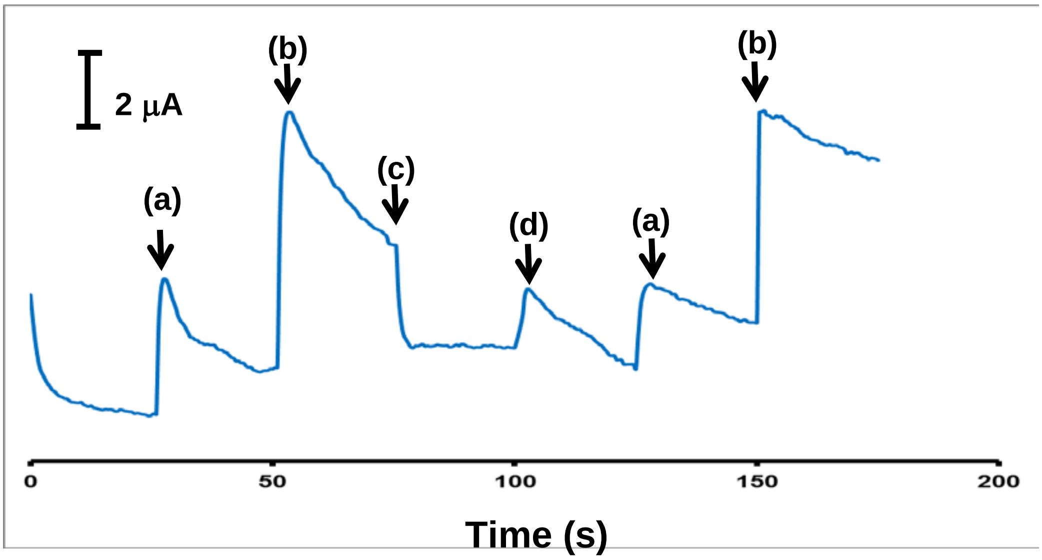

Amperometric response of (a) 4 mM (b) 6 mM at PAA/VS-PANI/$LuPc_2$/GOx-MFH biosensor (repetitive measurements)

**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 | - |