Electronic Supplementary Material (ESI) for RSC Advances.


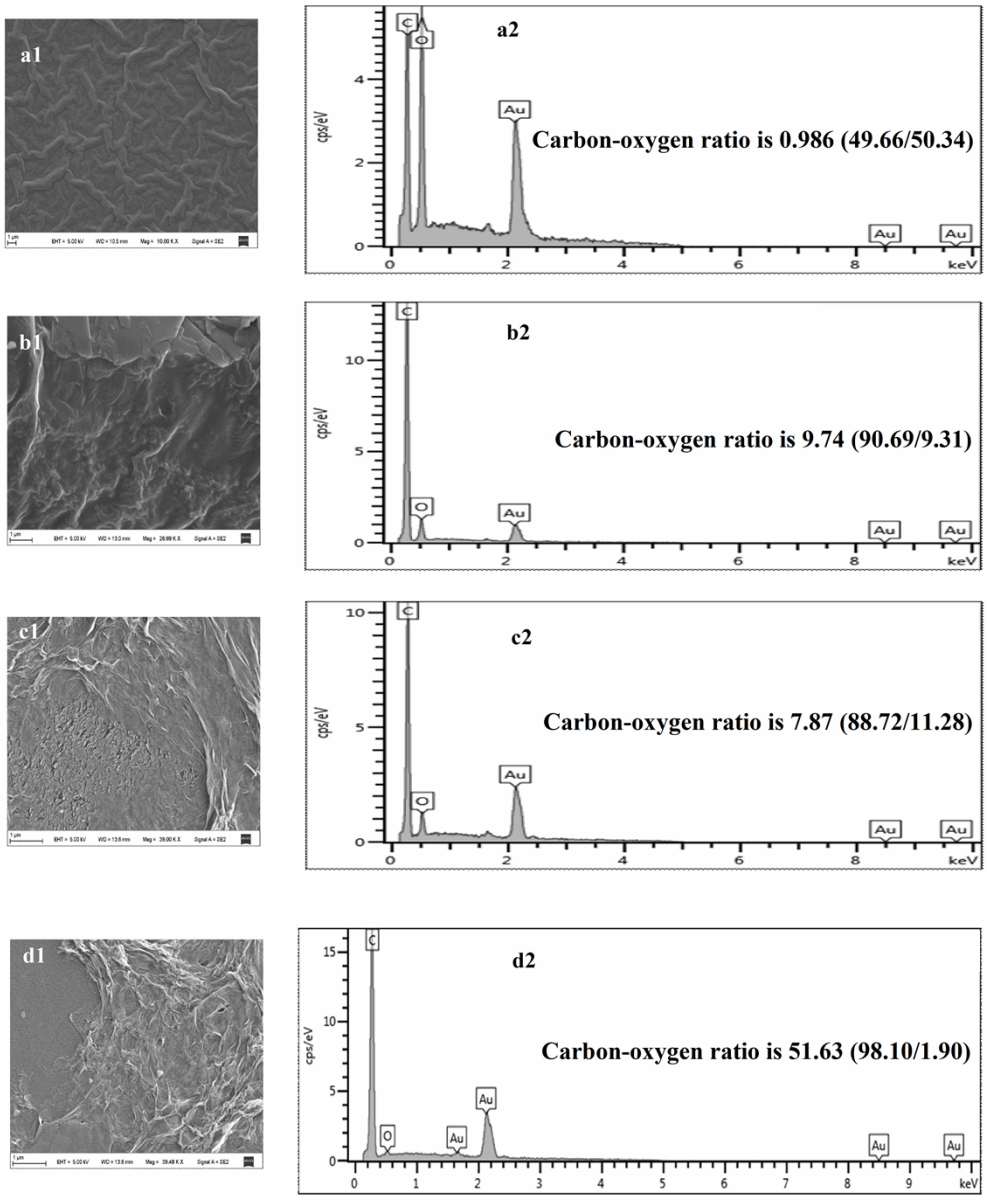


**Fig. S1** SEM and EDX of GO on GCE (a1, a2) and ERGO on CPE (b1, b2), GE (c1, c2), GCE (d1, d2).

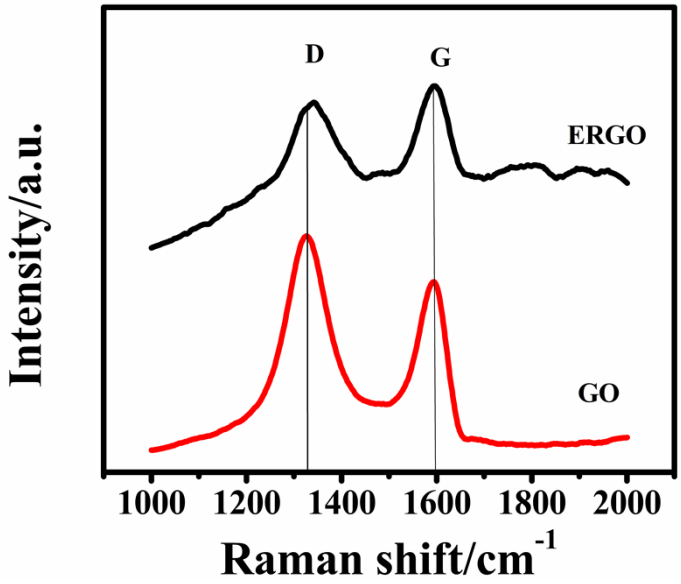


**Fig. S2** Raman spectroscopy of GO and ERGO showing how the Raman spectra change.

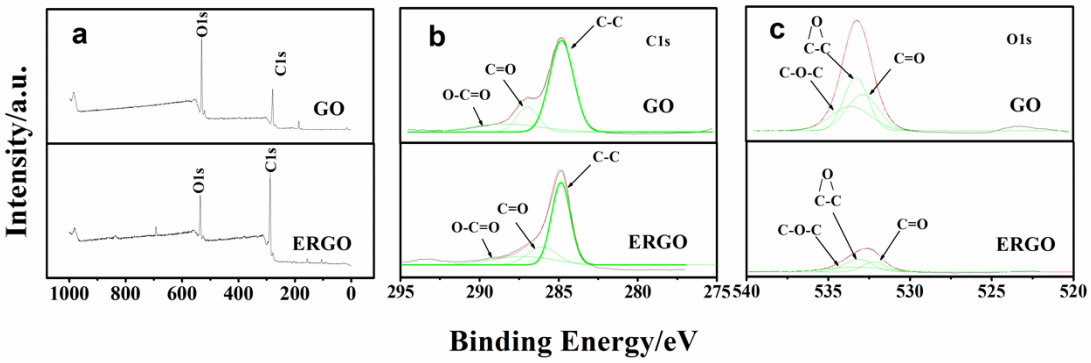


**Fig. S3** (a) Wide survey, (b) C 1s, and (c) O 1s XPS spectra of as-prepared GO (top) and ERGO (bottom) showing a significant reduction in the amount of oxygen containing functional groups on the ERGO from the reduction process.

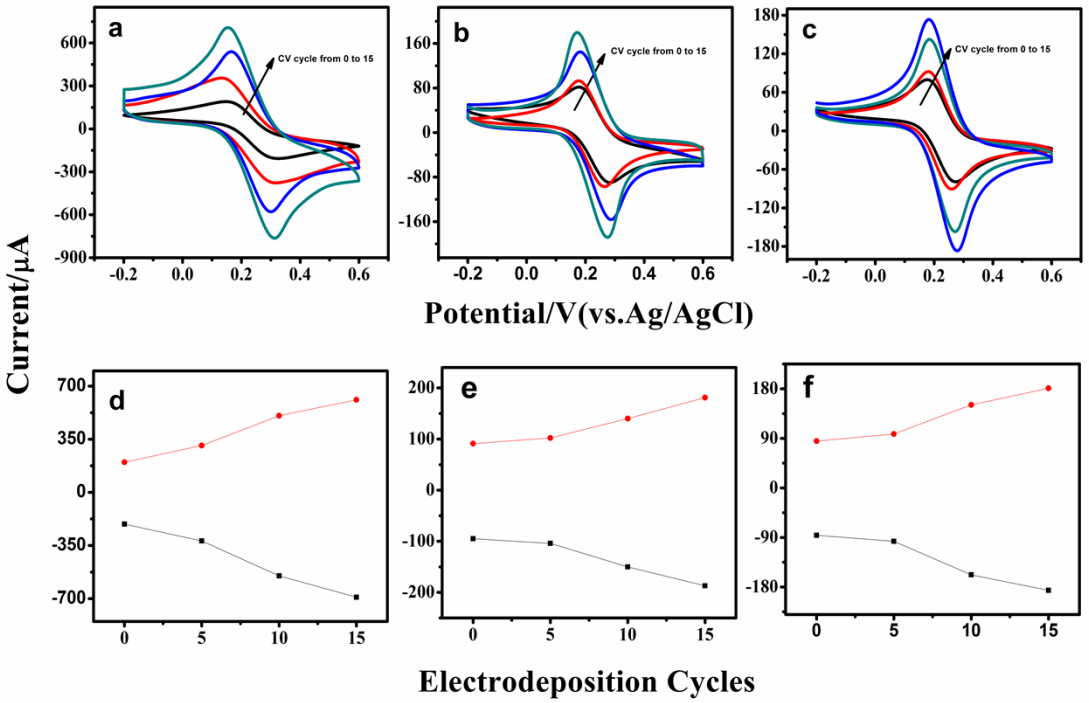


**Fig. S4** Cyclic voltammograms of 5 mM $K_3[Fe(CN)_6]/K_4$ [Fe $(CN)_6$] in 0.1 M KCl at the as-prepared ERGO/CPE (a), ERGO/GE (b), ERGO/GCE (c) under different electrodeposition cycles of 0, 5, 10 and 15; Peak currents of 5 mM $K_3[Fe(CN)_6]/K_4$ [Fe $(CN)_6$] in 0.1 M KCl at the as-prepared ERGO/CPE (a), ERGO/GE (b), ERGO/GCE (c) under different electrodeposition cycles.

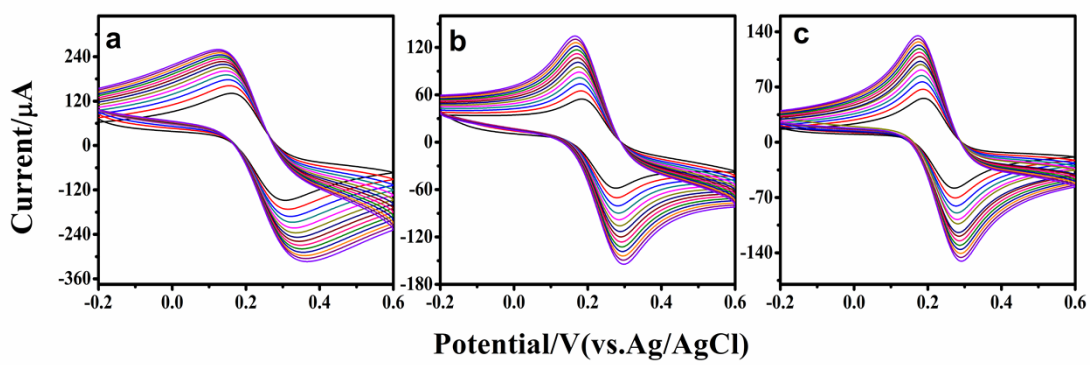


**Fig. S5** Cyclic voltammograms of 5 mM $K_3[Fe(CN)_6]/K_4[Fe(CN)_6]$ in 0.1 M KCl at the bare CPE (a), GE (b), and GCE (c) at different scan rate. Scan rates: 20,30,40,50, 60,70,80,90,100,110,120, 130, 140, 150 mV $s^{-1}$ (from bottom to top).

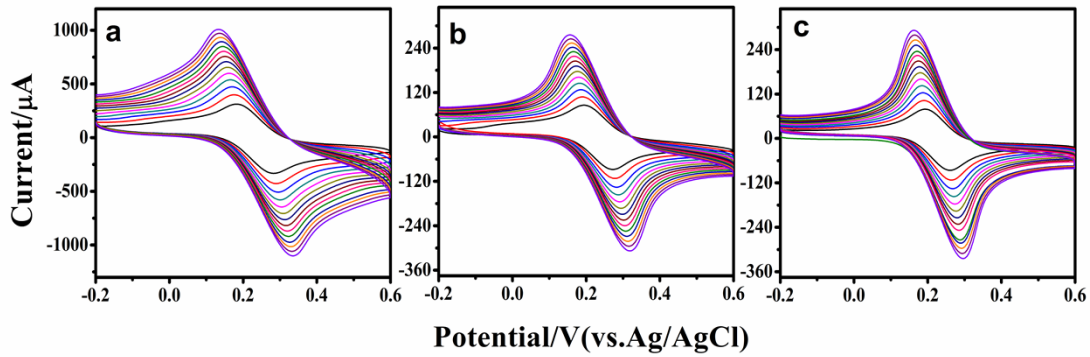


**Fig. S6** Cyclic voltammograms 5 mM $K_3[Fe(CN)_6]/K_4[Fe(CN)_6]$ in 0.1 M KCl at the ERGO modified CPE (a), GE (b), and GCE (c) at different scan rate. Scan rates: 20,30,40,50, 60,70,80,90,100,110,120, 130, 140, 150 mV $s^{-1}$ (from bottom to top).

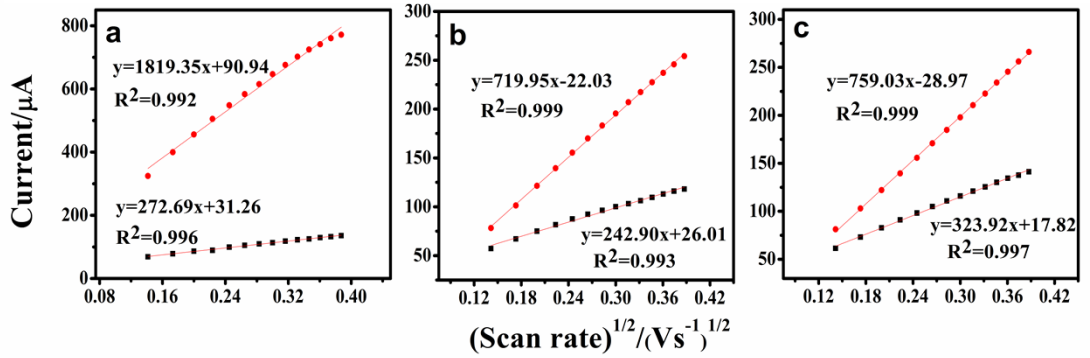


**Fig. S7** Plot of the peak currents of 5 mM $K_3[Fe(CN)_6]/K_4[Fe(CN)_6]$ vs $V^{1/2}$ for the CPE (a), GE (b), GCE (c) , respectively (black curves for the bare electrodes, red curves for the ERGO modified electrodes).

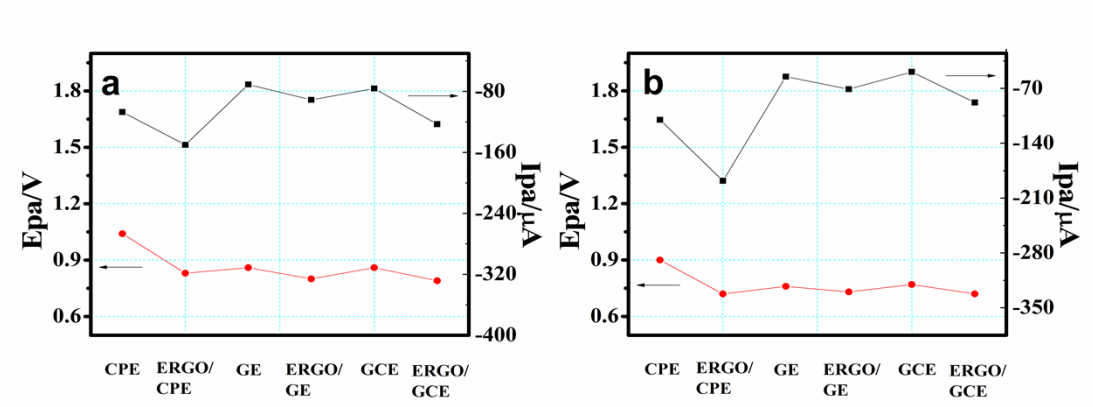


**Fig. S8** Peak potentials and currents of 5 mM $NaNO_2$ containing in 0.2 M PBS (pH=7) at different bare and modified electrodes presented by CVs (a) and DPVs (b) (black and red curves for the bare electrode and ERGO modifieds, respectively).

**Table S1** The area of different bare and modified carbon-based electrodes and the ratio of modified electrode area to bare electrode area.

| Electrodes | $A_{bare}/cm^2$ | $A_{modified}/cm^2$ | $A_{modified}/A_{bare}$ |
|---|---|---|---|
| CPE | 0.074 | 0.490 | 6.620 |
| GE | 0.066 | 0.192 | 2.900 |
| GCE | 0.088 | 0.202 | 2.295 |

**Notes:** The electroactive surface area of different electrodes was calcluated according to the Randled-Sevcik equation (as follows) by reported method described previously.[1-2]

$$I_p = 2.69 \times 10^{-5} A D^{\frac{1}{2}} n^{\frac{3}{2}} V^{\frac{1}{2}} C$$

$$A = \frac{slope}{2.69 \times 10^{-5} D^{\frac{1}{2}} n^{\frac{3}{2}} C}$$

(Here, D=7.6×10$^{-6}$ cm$^2$ s$^{-1}$; n=1; C=5×10$^{-6}$ mol cm$^{-3}$; Slope of different electrodes can be gained from Fig. S3.)

**Table S2** Electrochemical parameters of redox probe of 5 mM $K_3[Fe(CN)_6]/K_4[Fe(CN)_6]$ on different carbon-based electrodes by CVs and DPVs.

| Electrodes | CVs | | | | | DPVs | |
|---|---|---|---|---|---|---|---|
| | $E_{pa}$ (V) | $E_{pc}$ (V) | $\Delta E$ (V) | $I_{pa}$ (A) | $I_{pc}$ (A) | $E_{pa}$ (V) | $I_{pa}$ (A) |
| Bare CPE | 0.327 | 0.147 | 0.180 | -2.09×10$^{-4}$ | 1.99×10$^{-4}$ | 0.224 | -1.74×10$^{-4}$ |
| ERGO/CPE | 0.301 | 0.165 | 0.136 | -5.50×10$^{-4}$ | 5.05×10$^{-4}$ | 0.236 | -6.21×10$^{-4}$ |
| Bare GE | 0.283 | 0.178 | 0.105 | -8.75×10$^{-5}$ | 8.56×10$^{-5}$ | 0.224 | -1.50×10$^{-4}$ |
| GRERGO/GE | 0.287 | 0.184 | 0.103 | -1.50×10$^{-5}$ | 1.39×10$^{-4}$ | 0.236 | -2.44×10$^{-4}$ |
| Bare GCE | 0.279 | 0.184 | 0.095 | -9.76×10$^{-5}$ | 9.67×10$^{-5}$ | 0.220 | -1.53×10$^{-4}$ |
| ERGO/GCE | 0.270 | 0.185 | 0.085 | -1.58×10$^{-4}$ | 1.51×10$^{-4}$ | 0.230 | -3.30×10$^{-4}$ |

**Table S3** Electrochemical parameters of redox probe of 5 mM $K_3[Fe(CN)_6]/K_4[Fe(CN)_6]$ on different carbon-based electrodes.

| | **Bare CPE** | **ERGO Modified CPE** | **Bare GE** | **ERGO Modified GE** | **Bare GCE** | **ERGO Modified GCE** |
|---|---|---|---|---|---|---|
| $R_{ct}$ (Ω) | 233.6 | 5.927 | 327.0 | 10.0 | 260.0 | 11.4 |
| $K_{app}$ (V) | 2.20×10$^{-7}$ | 8.80×10$^{-6}$ | 1.60×10$^{-7}$ | 5.20×10$^{-6}$ | 2.00×10$^{-7}$ | 4.60×10$^{-6}$ |
| $A$(cm$^2$) | 0.074 | 0.4900 | 0.0660 | 0.1920 | 0.0880 | 0.2020 |

**Table S4** Electrochemical parameters of 5 mM $NaNO_2$ on different carbon-based electrode.

| **Electrodes** | **CVs** | | **DPVs** | |
|---|---|---|---|---|
| | $E_{pa}$ **(V)** | $I_{pa}$ **(A)** | $E_{pa}$ **(V)** | $I_{pa}$ **(A)** |
| Bare CPE | 1.04 | -1.07×10$^{-4}$ | 0.90 | -1.1 ×10$^{-4}$ |
| ERGO/CPE | 0.83 | -1.50×10$^{-4}$ | 0.72 | -1.88×10$^{-4}$ |
| Bare GE | 0.86 | -7.09×10$^{-5}$ | 0.76 | -5.50×10$^{-5}$ |
| ERGO/GE | 0.80 | -9.1×10$^{-5}$ | 0.73 | -7.1×10$^{-5}$ |
| Bare GCE | 0.86 | -7.6×10$^{-5}$ | 0.77 | -4.9×10$^{-5}$ |
| ERGO/GCE | 0.79 | -1.23×10$^{-4}$ | 0.72 | -8.80×10$^{-5}$ |

**References**


1. M. Yang, Y. Yang, Y. Liu, G. Shen and R. Yu, Biosens Bioelectron, 2006, **21**, 1125-1131.

2. Y. Zhang, X. Bai, X. Wang, K. K. Shiu, Y. Zhu and H. Jiang, Anal Chem, 2014, **86**, 9459-9465.