**Supporting Information**

**Journal:** RSC Advances

**Title:** Electrochemical properties of silver nanoparticle-supported reduced graphene oxide in nitric oxide oxidation and detection

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![Nyquist plots](image)

**Fig. S1** Nyquist plots obtained for bare GCE (a) and GO (b) for 1 mM K\textsubscript{3}[Fe(CN)\textsubscript{6}] in 0.1 M KCl.
**Bode phase and Bode impedance plots**

The phase peak shifts toward the low frequency region for the rGO-Ag nanocomposite modified electrodes indicated the fast electron-transfer process at the modified electrode surface (Fig. S2A). The phase angles of the rGO-Ag nanocomposite-modified electrodes were less than 90° at higher frequencies, which made it possible to assume that the electrode did not exhibit a capacitive behavior. The Bode impedance plots of the rGO-Ag nanocomposite-modified electrodes showed lower log Z values at a low frequency range of 1–100 Hz in the logarithm compared to the bare GCE and GO modified electrodes (Fig. S2B).
Fig. S2 (A) Bode phase plots obtained for bare GC (a) GO (b), rGO-Ag (0.5 M) (c), rGO-Ag (1.0 M) (d) and rGO-Ag (5.0 M) (e) modified GC electrodes for 1 mM K₃[Fe(CN)₆] in 0.1 M KCl. (B) Bode impedance plots (log Z vs. log f) obtained for bare GC (a) GO (b), rGO-Ag (0.5 M) (c), rGO-Ag (1.0 M) (d) and rGO-Ag (5.0 M) (e) modified GC electrodes for 1 mM K₃[Fe(CN)₆] in 0.1 M KCl.
rGO-Ag nanocomposite modified GCE characterization and coverage of Ag NPs on GCE surface

A cyclic voltammogram was recorded at the GC/rGO-Ag (5.0 M) nanocomposite-modified electrode in the 0.1 M phosphate buffer (pH 2.5) to confirm the existence of Ag on the GCE surface (Fig. S3b). The anodic peak current appearing in the positive scan region at +0.16 V proves the oxidation of Ag to Ag$_2$O, which confirms the presence of Ag NPs on the modified electrode surface$^1$ and reveals that the Ag NPs were in good electrical contact with the GCE electrode surface. Nevertheless, no typical redox peaks were observed for the GO-modified GCE (Fig. S3a). For a further examination, the surface coverage of the Ag NPs on the electrode surface of the rGO-Ag (0.5 M, 1.0 M, and 5.0 M) nanocomposite-modified electrodes was also calculated using Laviron’s equation (eqn (1)).$^2$

\[
I_p = \frac{n^2 F^2 \nu A \Gamma}{4RT} \quad (1)
\]

where $I_p$ is the anodic peak current; $n$ is the number of electrons transferred; $\nu$ is the scan rate; $\Gamma$ is the surface coverage of the Ag NPs; $A$ is the surface area of the electrode; and $T$, $F$, and $R$ are absolute temperature, Faraday constant, and mol gas constant, respectively. Using eqn. (1), the surface coverage ($\Gamma$) values of the Ag NPs were calculated to be $1.678 \times 10^{-9}$ mol cm$^{-2}$, $1.968 \times 10^{-9}$ mol cm$^{-2}$, and $2.099 \times 10^{-9}$ mol cm$^{-2}$ using the slopes ($I_p/\nu$) obtained from the cyclic voltammograms of the rGO-Ag (0.5 M), rGO-Ag (1.0 M), and rGO-Ag (5.0 M) nanocomposite-modified electrodes recorded in a 0.1 M phosphate buffer (pH 2.5) at different scan rates (Fig. S4(A–C)). Based on the calculation, it was confirmed that the rGO-Ag (5.0 M) nanocomposite-modified electrode received the highest coverage of Ag NPs on its surface, which was beneficial for the electrocatalytic reactions.
Fig. S3 Cyclic voltammogram recorded at GO (a) and rGO-Ag (5.0 M) nanocomposite (b) modified electrode in 0.1 M phosphate buffer (pH 2.5) with scan rate of 50 mV s$^{-1}$. 
Fig. S4 Cyclic voltammograms recorded at rGO-Ag (A: 0.5 M, B: 1.0 M and C: 5.0 M) nanocomposite modified electrodes in N$_2$-saturated 0.1 M phosphate buffer (pH 2.5) with different scan rates (5-100 mV s$^{-1}$) and inset shows the plot of anodic peak current versus scan rate.
**Fig. S5** Cyclic voltammograms recorded for 1 mM NO$_2^-$ at the GC/rGO-Ag (5.0 M) nanocomposite modified electrode during different days in 0.1 M PBS (pH 2.5) with a scan rate of 50 mV s$^{-1}$. 

![Cyclic voltammograms recorded for 1 mM NO2- at the GC/rGO-Ag (5.0 M) nanocomposite modified electrode during different days in 0.1 M PBS (pH 2.5) with a scan rate of 50 mV s^-1.](image-url)
**Fig. S6** Cyclic voltammograms obtained at the rGO-Ag (5.0 M) nanocomposite modified electrode for the successive addition of each 1 mM of NO$_2^-$ (1-12 mM) in 0.1 M phosphate buffer (pH 2.5) with a scan rate of 50 mV s$^{-1}$. Inset: Plot of peak current versus concentration of NO$_2^-$. 
Fig. S7 Cyclic voltammograms recorded at rGO-Ag (5.0 M ascorbic acid) nanocomposite modified electrode for 5 mM of NO$_2^-$ in 0.1 M phosphate buffer (pH 2.5) with various scan rates (a: 5, b: 10, c: 20, d:50, e: 75, f: 100 and g: 150 mV s$^{-1}$). Inset: Plot of peak current versus square root of scan rate (A) and plot of peak potential versus log (scan rate) (B).
Fig. S8 Chronoamperograms obtained at rGO-Ag (5.0 M) nanocomposite modified electrode with different concentrations of NO$_2^-$ in 0.1 M phosphate buffer (pH 2.5). Applied potential was +0.96 V (A) and plot of current versus t$^{-1/2}$ (B). Inset: Plot of slopes obtained from straight lines of ‘B’ versus concentration of NO$_2^-$. 
Table S1 Impedance values obtained from the fitted impedance spectrum of rGO-Ag (5.0 M) nanocomposite.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Impedance Values</th>
<th>Relative standard error (%)</th>
</tr>
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<tbody>
<tr>
<td>Solution resistance ($R_s$)</td>
<td>178.8 Ω</td>
<td>2.177</td>
</tr>
<tr>
<td>Double layer capacitance ($C_{dl}$)</td>
<td>5.228E-7 F</td>
<td>3.106</td>
</tr>
<tr>
<td>Charge transfer resistance ($R_{ct}$)</td>
<td>613.8 Ω</td>
<td>1.76</td>
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<tr>
<td>Warburg impedance ($Z_W$)</td>
<td>0.000404</td>
<td>1.399</td>
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</table>
Scheme S1. Graphical illustration of NO electrooxidation at the rGO-Ag (5.0 M) nanocomposite modified GC electrode.

Reference