

Supporting Information

Simple preparation and highly selective detection of silver ions using an electrochemical sensor based on sulfur-doped graphene and 3,3',5,5'-tetramethylbenzidine composite modified electrode

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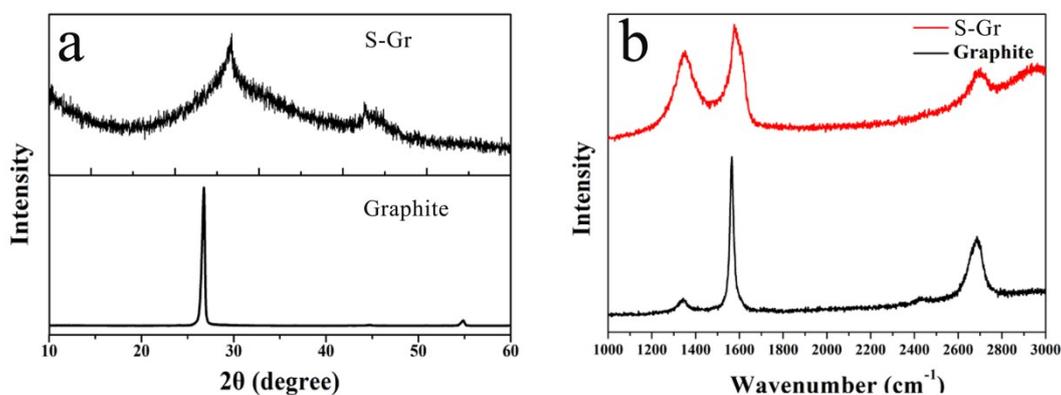


Fig. S1 (a) XRD patterns and (b) Raman spectra of graphite and the exfoliated S-Gr.

The crystal structure of the pristine graphite and the exfoliated S-Gr were analyzed by conducting X-ray diffraction (XRD) studies in Fig. S1a. The pristine graphite exhibit a sharp peak centered at 26.6° and 54.7° corresponding to the (002) and (004) planes of graphite crystal. The exfoliated S-Gr displays a broad (002) diffraction peak due to the corrugated structure of the S-Gr and the stacked S-Gr layers. XRD result proved the successful exfoliation of graphite to producing S-Gr, which is in good agreement with the reported value.

Raman spectra of graphite and the exploited S-Gr reflect the significant structural changes from graphite to S-Gr in Fig. S1b. Two remarkable peaks in the Raman spectrum are the D band (defects) and the G band (in-plane vibration of sp^2 carbon atoms). The Raman spectrum of the graphite in Fig. S1b displays a prominent G peak at 1600 cm^{-1} corresponding to the first-order scattering of the E_{2g} vibration mode. The Raman spectrum of the exfoliated Gr shows that the G band is broadened and the peak of D band is present at 1370 cm^{-1} . The ratio of I_D/I_G corresponds to the number of defects in graphene. The intensity of G band is higher than that of D band for the exfoliated S-Gr, thus, the ratio of I_D/I_G is less than 1, which is much lower than that of chemically or thermally reduced graphene oxide (1.2–1.5).

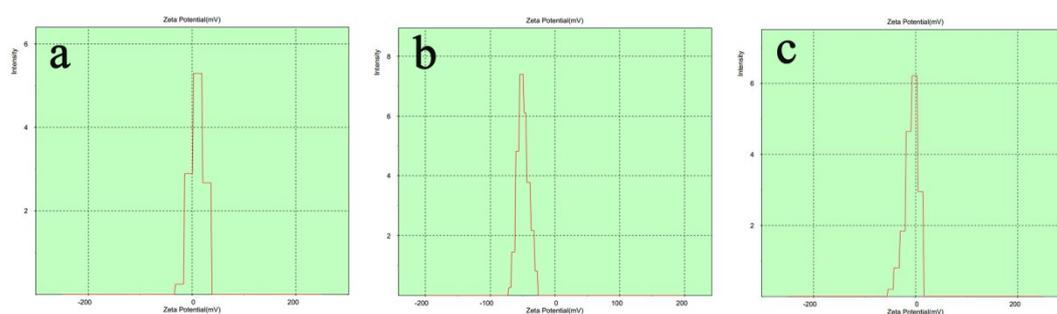


Fig. S2 Zeta potential of (a) TMB, (b) S-Gr and c. S-Gr-TMB.

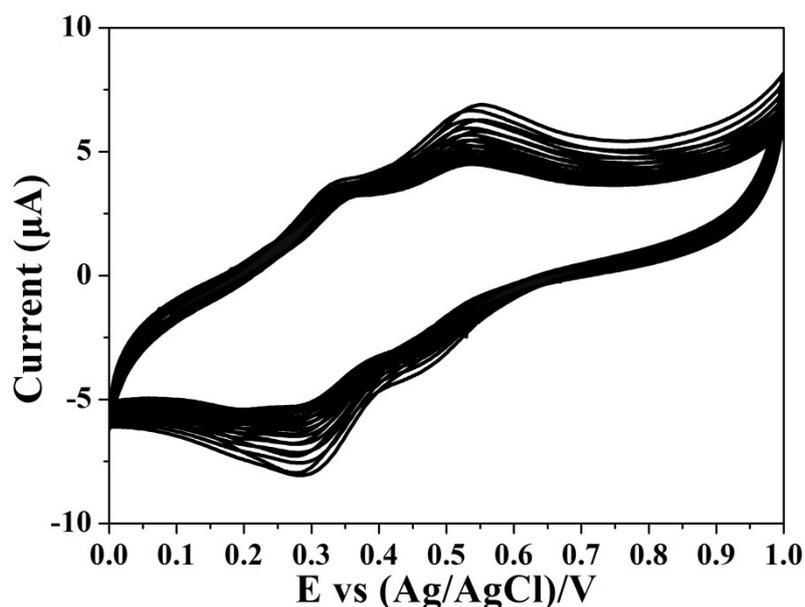


Fig. S3 Continuous CVs of Gr-TMB/GCE recorded for 20 cycles in NaAc buffer solution (0.2 mol/L NaAc/HAc, pH = 4) at a scan rate of 50 mV/s.

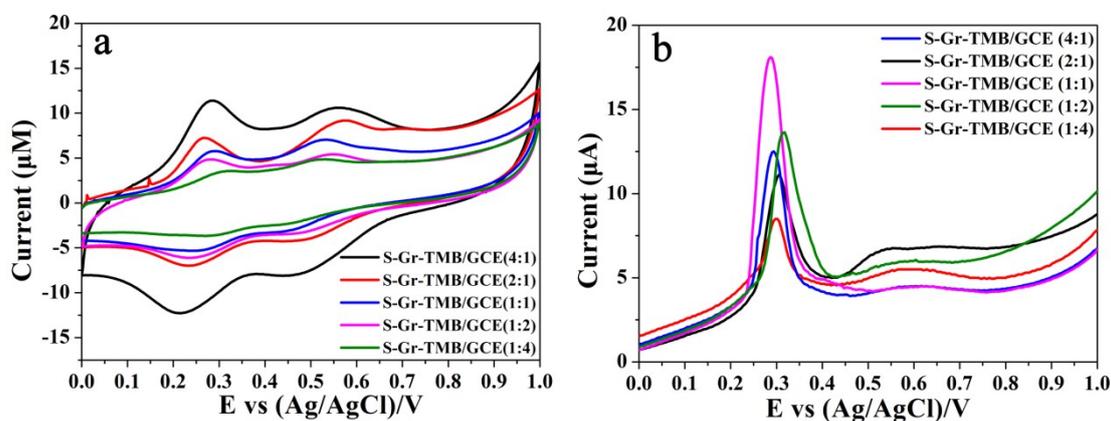


Fig. S4 (a) CVs of the S-Gr-TMB/GCE at the five different volume ratios of S-Gr to TMB (4:1 (Black), 2:1 (Red), 1:1 (Blue), 1:2 (Pink) and 1:4 (Green)); (b) DPV scans of the S-Gr-TMB/GCE at the five different volume ratios of S-Gr to TMB (4:1 (Blue), 2:1 (Black), 1:1 (Pink), 1:2 (Green) and 1:4 (Red)).

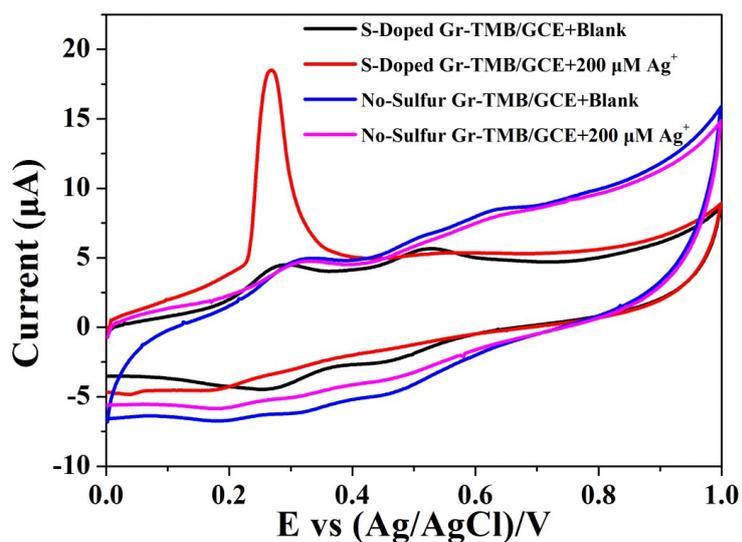


Fig. S5 CVs of S-Gr-TMB/GCE without (Black) and with the presence of 200 μmol/L Ag⁺ (Red), Gr-TMB/GCE without (Blue) and with the presence of 200 μmol/L Ag⁺ (Pink).

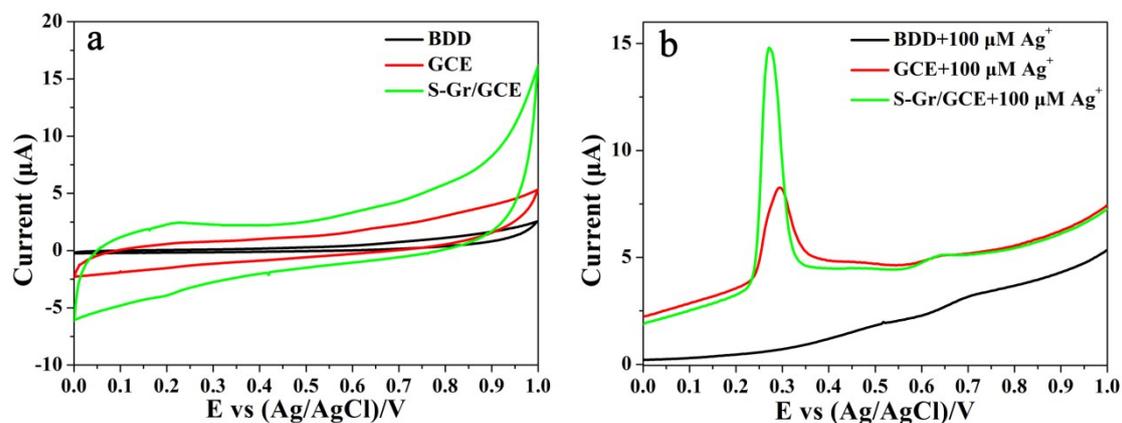


Fig. S6 (a) CVs of BDD (Black), GCE (Red) and S-Gr/GCE (Green) in NaAc buffer solution (0.2 M NaAc/HAc, pH = 4); (b) DPV scans of BDD (Black), GCE (Red) and S-Gr/GCE (Green) with the presence of 100 μM Ag⁺.

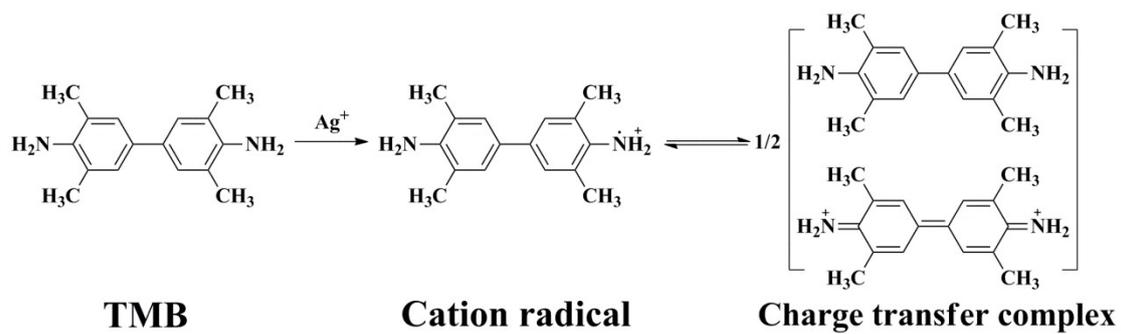


Fig. S7 The coordination scheme of Ag^+ to TMB.