Supplementary Information

Carboxyl functionalized graphene oxide based electrochemical sensor for detection of dopamine in presence of ascorbic acid, uric acid and synthetic cerebrospinal fluid

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Received 10 December 2021; revised and accepted 29 March 2022

UV-Visible absorption spectroscopy:

The UV-Visible absorption spectrum of GO and CGO shows two peaks. In GO, λ_{max} peak is observed at 227 nm due to $\pi \rightarrow \pi^*$ transition of the atomic C-C bonds (conjugation) and a shoulder is observed at 310 nm due to $n \rightarrow \pi^*$ transition of the carbonyl groups. Similarly, in CGO, λ_{max} peak is observed at 234 nm ($\pi \rightarrow \pi^*$ transition of the atomic C-C bonds and carbonyl groups) and a shoulder is observed at 307 nm ($n \rightarrow \pi^*$ transition of the carbonyl groups) (Fig. S1). Due to the presence of unsaturated carbonyl groups in CGO, the $\pi \rightarrow \pi^*$ transition requires lesser energy, so it absorbs at a longer wavelength.

FT-IR spectroscopy:

The FT-IR spectrum of GO shows peaks at 3427 cm^{-1} (O–H str.), 2925 cm^{-1} and 2850 cm^{-1} (asymmetric and symmetric str. of $–CH_2$), 1594 cm^{-1} (C=C str.), 1388 cm^{-1} (C–O str.), 678 cm^{-1} (ar. C–H bending).The FT-IR spectrum of CGO shows peaks at 3447 cm^{-1} (O–H str.), 2926 cm^{-1} and 2850 cm^{-1} (asymmetric and symmetric str. of $–CH_2$), 1686 cm^{-1} (C=O), 1621 cm^{-1} (C=C str.), 1379 cm^{-1} (C–O str.), 750 cm^{-1} (ar. C–H bending) (Fig. S2)

Powder X-ray Diffraction studies:

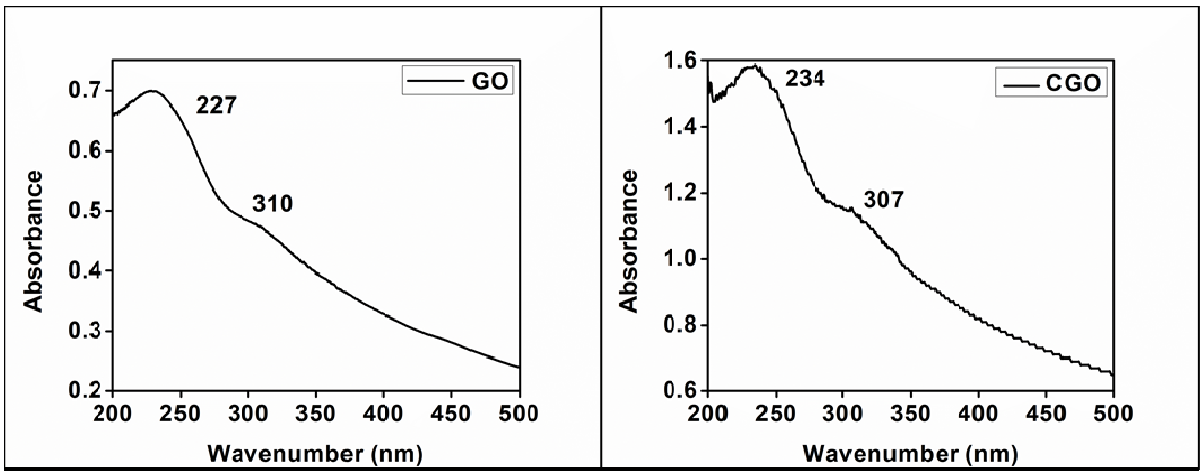
The powder X-ray diffractogram of GO shows the characteristic peak at $2\theta = 9.85°$, corresponding to an interlayer spacing $d_{avg} = 8.97Å$. This peak is observed for CGO at $2\theta = 8.88°$. The interlayer spacing for CGO increases to $d_{avg} = 9.95Å$, which indicates the presence of bulkier carboxyl groups in place of other oxygen functionalities (Fig. S3). The [002] reflection is attributed to the removal of stacking nature in GO, which is again established in CGO.

Thermogravimetric Analysis:

The thermal decomposition of GO and CGO was studied using TGA. In GO, the weight loss upto 100 °C is due to theremoval of water molecules bound to the surface. Major weight loss is observed from about 200 °C to 270 °C, due to the release of carbon monoxide, carbon dioxide and steam from the most labile functional groups. The further slow weight loss from 300 °C is due to the removal of more stable oxygen functionalities. The TGA curve of CGO shows weight loss up to 100 °C due to the release of surface bound water molecules. Further weight loss occurs from about 200 °C due to the removal of all the oxygen functionalities (Fig. S4).

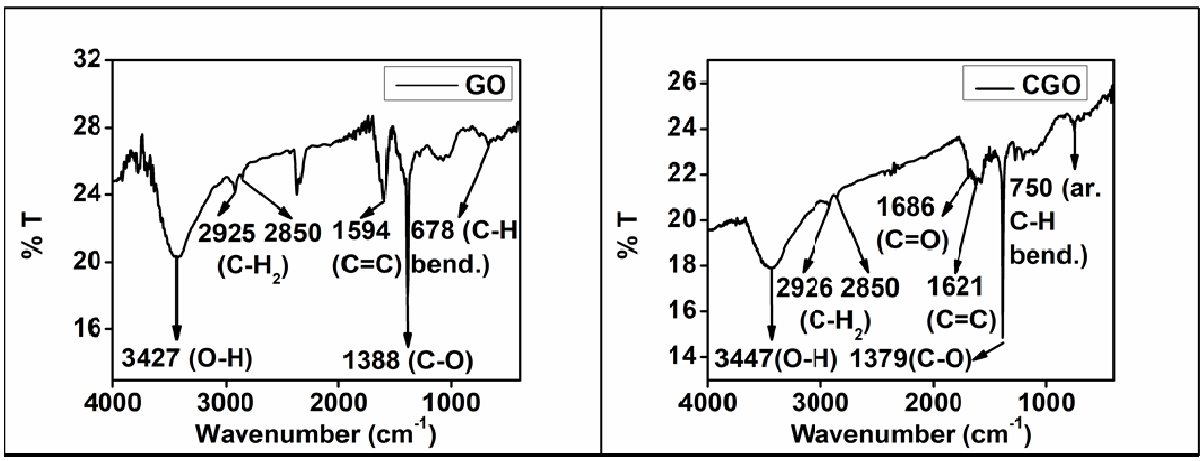
Scanning Electron Microscopic studies:

The FESEM image of GO shows sheet-like surface morphology. 'Ripple' like morphology is observed for CGO, which hints the presence of carboxyl groups in between the ripples (Fig. S5).



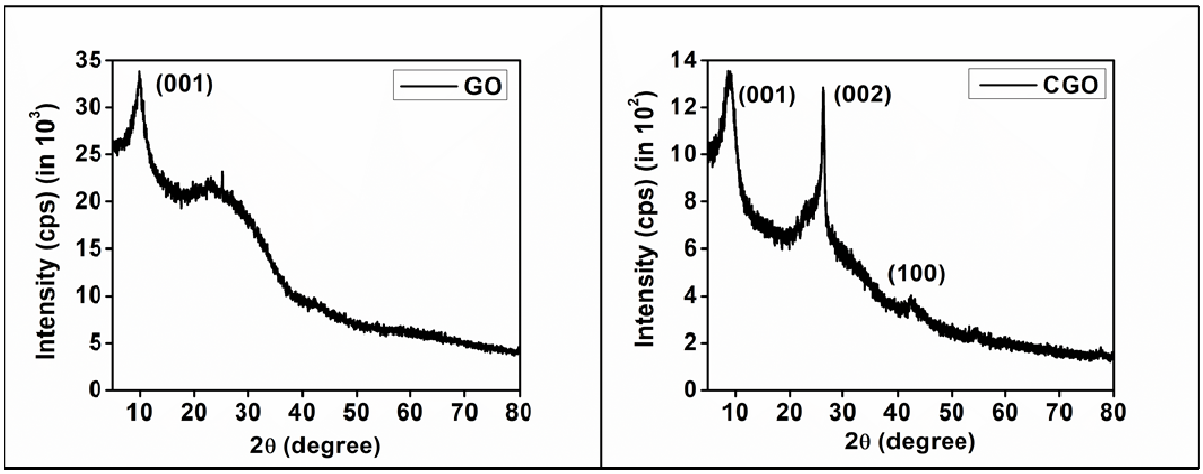
(a) (b)

Fig. S1 - UV-Visible absorbance spectra of (a) aqueous GO dispersion, and (b) aqueous CGO dispersion



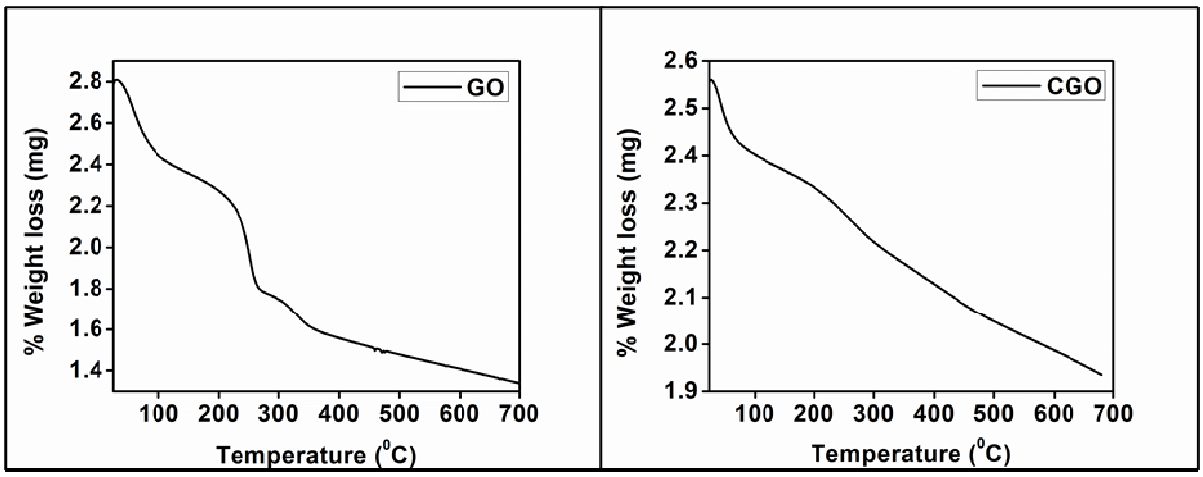
(a) (b)

Fig. S2 - FT-IR spectra of (a) GO and (b) CGO, in KBr pellet



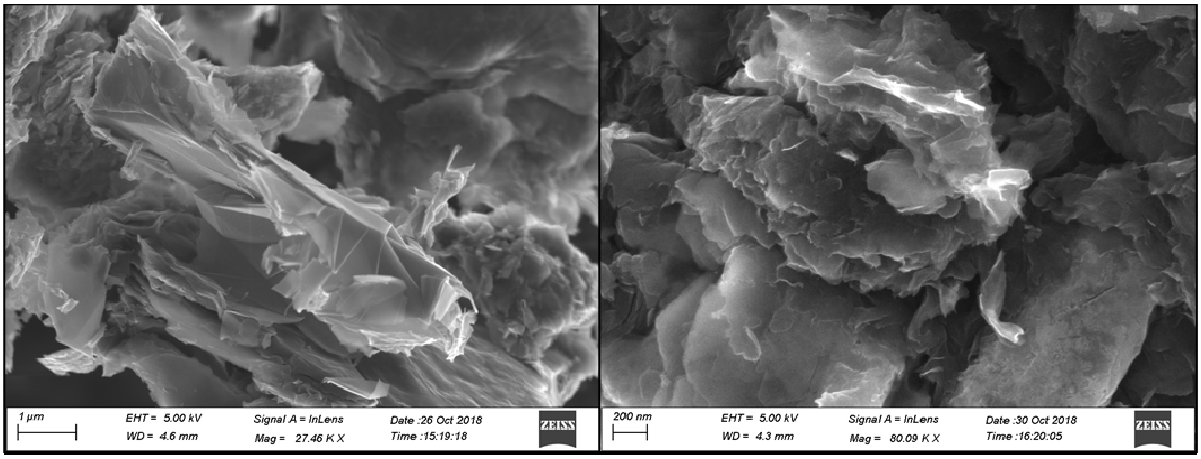
(a) (b)

Fig. S3 – Powder X-ray diffractogram of (a) GO and (b) CGO



(a) (b)

Fig. S4 – % Weight lossversus temperature curves obtained from thermogravimetric analyses of (a) GO and (b) CGO



(a) (b)

Fig. S5 – FESEM images of (a) GO and (b) CGO