Supplementary Information

Effective dispersion of oxidized multi-walled carbon nanotubes using a water-soluble *N,O*-carboxymethyl chitosan via non-covalent interaction

Jinling Gao*, Tongtong Li, Mingzhe Song, Yuyao Zhao, Anxu Wang

College of Science, Heilongjiang Bayi Agricultural University, Daqing, 163319, China

*Corresponding author, Dr Jinling Gao, e-mail: gjlscl@sina.com

1. FTIR spectra of (a) MWCNTs and (b) oMWCNTs

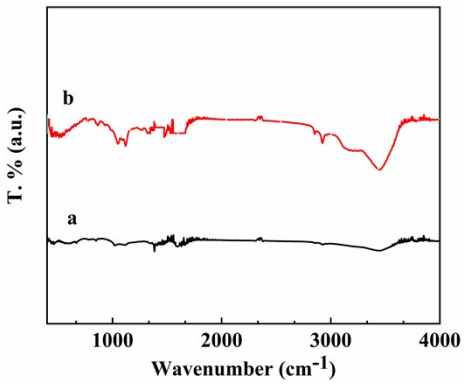

Fig. S1 FTIR spectra of (a) MWCNTs and (b) oMWCNTs.

2. Cyclic Voltammetric and Impedance Measurements

Cyclic Voltammograms (CV) and Electrochemical Impedance Spectroscopy (EIS) measurements were conducted to investigate the electrochemical behavior of the GCE modified with N,O-CMCS/oMWCNTs. 30 μL oMWCNTs or *N,O*-CMCS/oMWCNTs dispersed into ethanol were drop on the GEC prepared by microinjector, then dried naturally and found to be tiled a film of oMWCNTs or *N,O*-CMCS/oMWCNTs, The GCE modified was put into the three-electrode system. There have PBS (pH=7.4) aqueous and 0.169 g $K_3Fe(CN)_6$ (5 mM) in this three-electrode system.

Cyclic voltammetry curves (CV) of bare GCE (a), GCE modified by oMWNTs (b), and GCE modified by *N,O*-CMCS/oMWCNTs (c) are shown in Fig. S2. The potential difference of GCE modified by *N,O*-CMCS/oMWCNTs (0.117 V) was less than that of GCE modified by oMWNTs (0.680 V) obviously, which illustrates the increase in electronic transmission speed of the GCE modified by *N,O*-CMCS/oMWCNTs. Moreover, the current difference of GCE modified by *N,O*-CMCS/oMWCNTs (0.142 A) was more than that of GCE modified by oMWNTs (0.093 A) obviously, which further illustrates the excellent electronic transmission capability of the GCE modified by *N,O*-CMCS/oMWCNTs. Therefore, the electrode modified by *N,O*-CMCS/oMWCNTs has an excellent electrical conductivity [1].

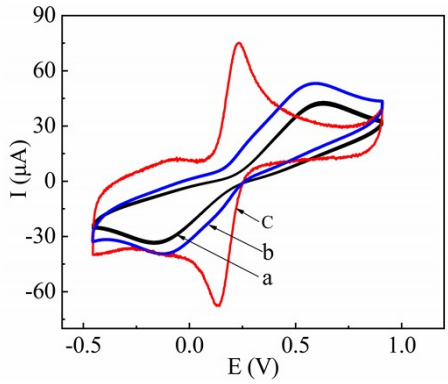

Fig. S2 The cyclic voltammograms of bare GCE (a),GCE modified by oMWNTs (b) and *N,O*-CMCS/oMWCNTs (c) in the PBS (pH=7.4, 5mm $K_3Fe(CN)_6$, 150mv/s).

Electrochemical impedance spectra (EIS) were also carried out to confirm the results of the cyclic voltammetry. As shown in Fig. S3, the comparison of the decrease in the charge transfer resistance of the *N,O*-CMCS/oMWCNTs modified-GCE with that of the oMWCNTs modified-GCE confirms the results of the cyclic voltammetry [2]. It also illustrates the GCE modified with *N,O*-CMCS/oMWCNTs has a good electrical conductivity. These results demonstrate that the proposed N,O-CMCS/oMWCNTs has significant potential for the the design of electrochemical sensors.

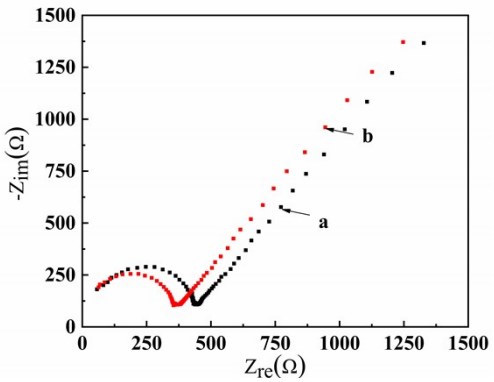

Fig. S3 Nyquist plots of GCE modified by oMWNTs (a) and *N,O*-CMCS/oMWCNTs (b) in the PBS (0.1 Hz-2500 kHz, 150 mv, pH=7.4, 5mm $K_3Fe(CN)_6$).

References

[1] M. Shalauddin, S. Akhter, S. Bagheri, M. S. Abd Karim, N. A. Kadri and W. J. Basirun. *Int. J. Hydrogen Energ.*, 2017, 42(31): 19951-19960.

[2] S. Akbarzadeh, H. Khajehsharifi. *Biosensors*, 2022, 12(7): 468.