Freestanding flexible graphene foams@Polypyrrole@MnO_2 Electrodes for high-performance supercapacitors

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Supplementary Figures

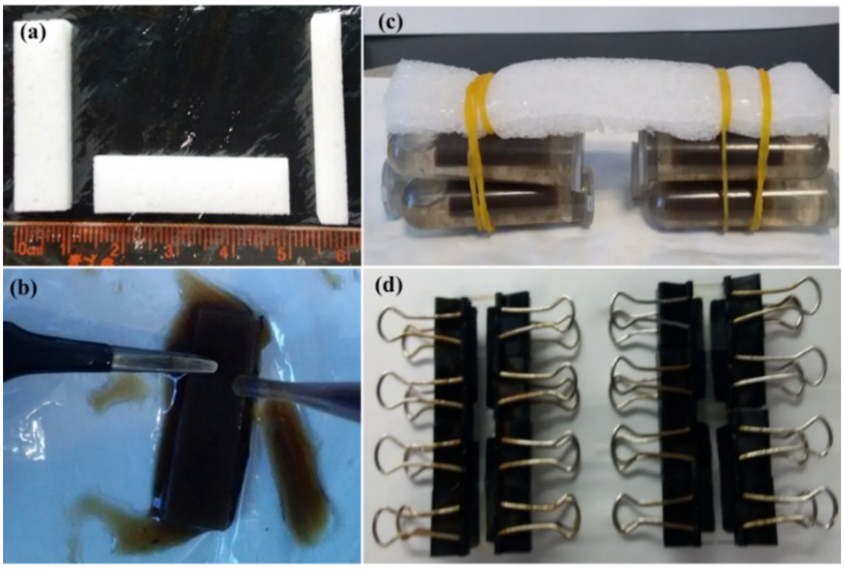

Fig. S1. Photographs of (a) the shapes and sizes of MF. (b) The schematic diagram of “drop and press” method, (c) MF/GO in the sample tubes containing HBr and (d) MF/rGO sandwiched into crab-like with two piece of glass slides under the assistance of eight clips.

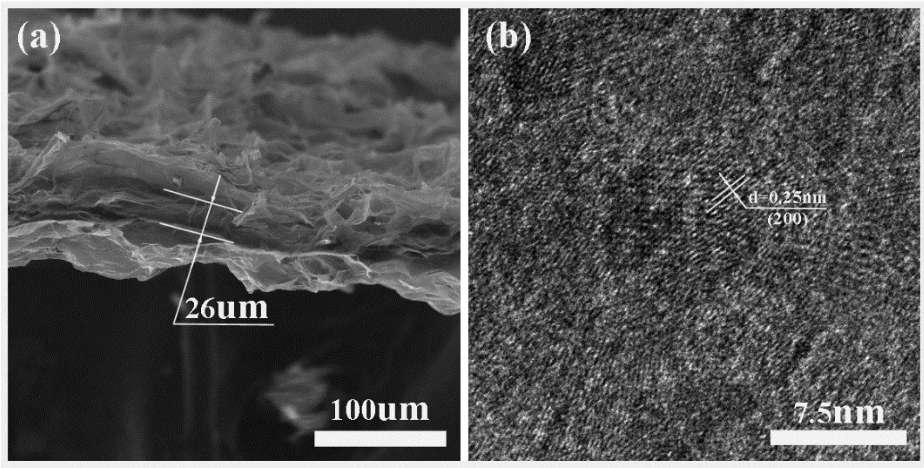

Fig. S2 (a) SEM image of the cross section of GF. (b) The high-resolution TEM image of MnO_2 nanosheet from flower-like MnO_2 on GF.

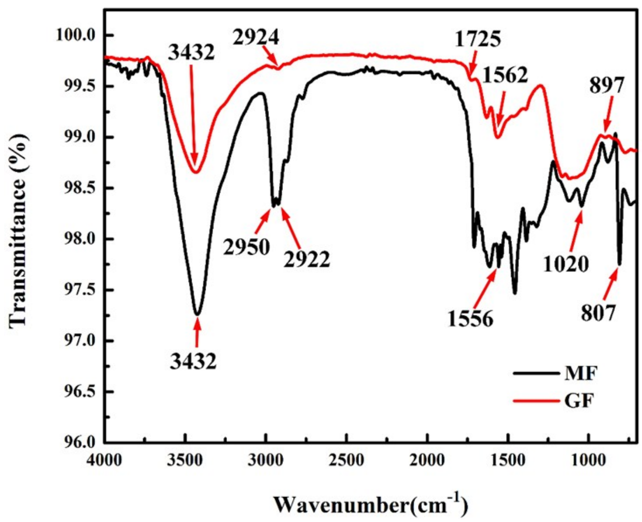

Fig. S3. FTIR of MF and GF.

In Fig. S3, the FTIR of MF showed the following characteristic absorptions, the stretching vibration of hydroxyl groups at 3424 cm^{-1} overlapped with the NH_2 vibration, whereas the bands at 1020 and 879 cm^{-1} can be dedicated to the ether linkages such as $-CH_2-O-CH_2-$ and $-CH_2-OH$ and the absorption peaks at 2950 and 2922 cm^{-1} can be ascribed to the methylene groups.[1, 2] The absorption peaks at 1556 and 807 cm^{-1} is attributed to the 1,3,5-s-triazine ring.[3] Compared to the MF, the FTIR of GF showed the absorption peak of -NH/OH and $-CH_2-$ at 3432 and 2924 cm^{-1}, the peak of C=O at 1725 cm^{-1}, the peaks of C=C and C=N at 1630 and 1562 cm^{-1}. It can be seen that the surface of graphene nanosheets was modified by containing -N/O functional groups derived from MF.

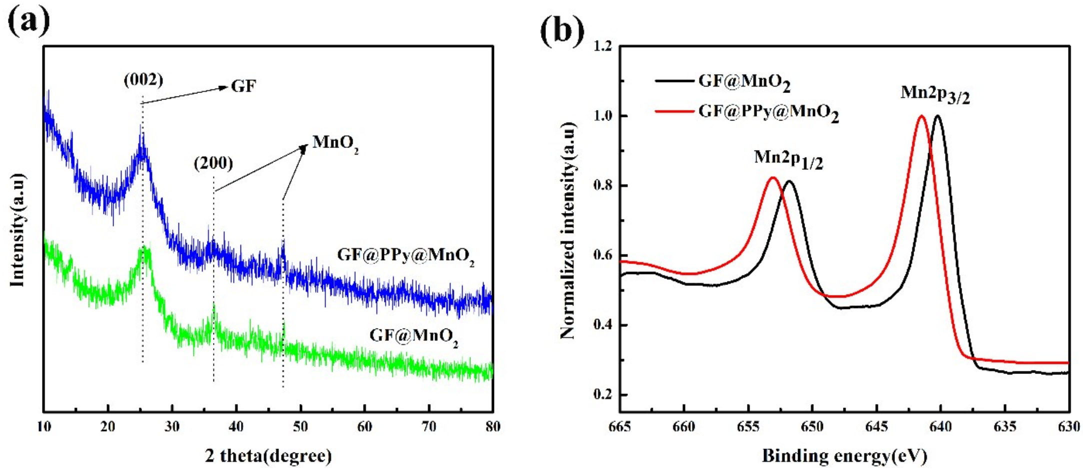

Fig. S4. (a) The XRD and (b) narrow XPS spectra of Mn 2p peaks of $GF@MnO_2$ and $GF@PPy@MnO_2$.

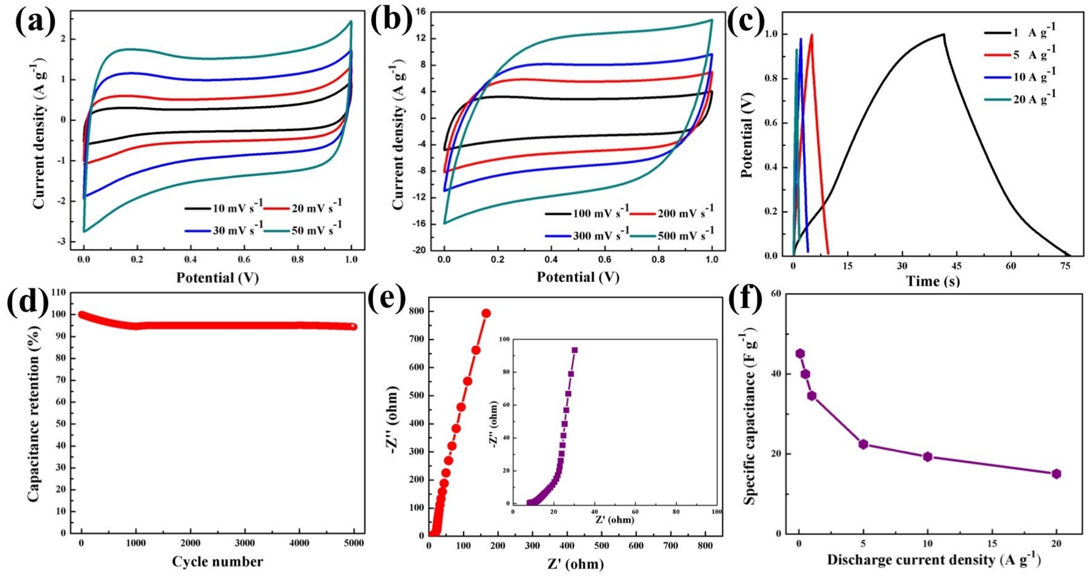

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Fig. S5. Electrochemical characterization of GF in 1 M Na_2SO_4. (a) and (b) CV curves. (c) GCD curves. (d) Cycling performance of GF at current density of 10 A g^{-1}. (e) Nyquist plots of GF, inset: the details of high frequency region). (f) Specific capacitance of GF as a function of discharge current density.

References

1. G. P. Hao, W. C. Li, D. Qian and A. H. Lu, Advanced materials, 2010, 22, 853-857.
2. Y. Liu, Y. Ma, S. Guang, H. Xu and X. Su, J. Mater. Chem. A, 2014, 2, 813-823.
3. Y. Wu, Y. Li, L. Qin, F. Yang and D. Wu, J. Mater. Chem. B, 2013, 1, 204-212.