Supporting Information

Highly thermal conductive graphene-based electrodes for supercapacitors with excellent heat dissipation ability

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1. Preparation of MnO_2 nanoparticles and morphology characterizations

The MnO_2 nanoparticles were prepared by redox reaction of $KMnO_4$ and $MnSO_4$ as chemical equation (S1)

$$MnO_4 \quad + \quad Mn^{2+} \quad \rightarrow \quad 2MnO_2 \text{ (S1)}$$

The MnO_2 nanoparticles have good dispersion and uniform size as shown in Fig. S1.

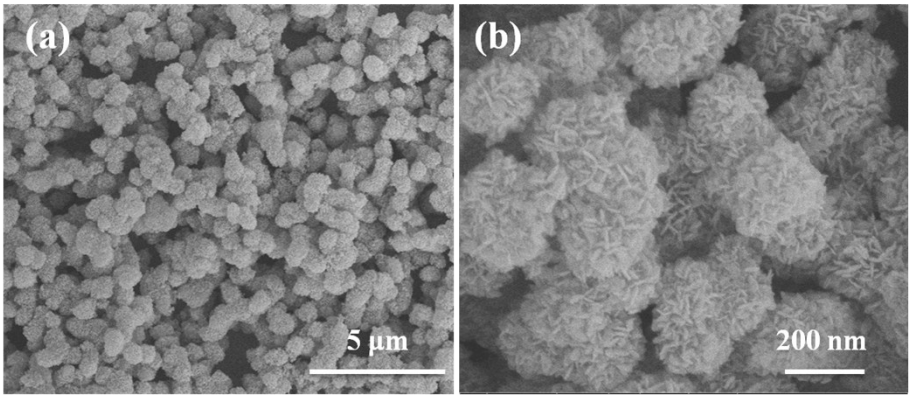

Fig. S1. SEM images of MnO_2 nanoparticles at different magnifications.

2. The preparation of GN-MnO_2 film

To achieve a favorable electrostatic assembly between the MnO_2 nanoparticles and GO nanosheets, MnO_2 nanoparticles were firstly modified by aminopropyltrimethoxysilane (APS) to render the nanoparticles surface positively. In contrast, the zeta potential of GO solution is negative. Therefore, assembly between the modified MnO_2 nanoparticles and GO nanosheets *via* electrostatic interactions was easily triggered to form the MnO_2@GO nanostructure. The MnO_2@GO solution through vacuum filtration to assemble the MnO_2@GO film, after peeling off from the filter paper, the MnO_2@GO film was hot pressed which made it more flatter and assembly the layer to layer more compact. The thickness of the films could be well controlled from several to several ten micrometers by adjusting the volume and concentration of MnO_2@GO suspension. Thermal annealing at 900 °C in Ar was further employed for the reduction of the MnO_2@GO film. Finally, a free-standing and paper-like GN-MnO_2 film was obtained. The digital photographs of the experimental setup and GN-MnO_2 films were illustrated in Fig. S2.

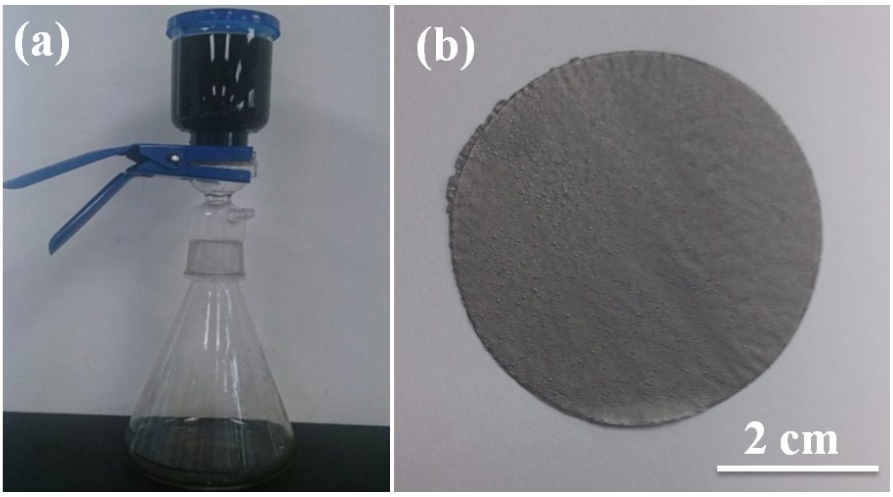

Fig. S2. (a) The setup of vacuum filtration for GO-MnO_2 solution, (b) Digital photos of GN-MnO_2 film.

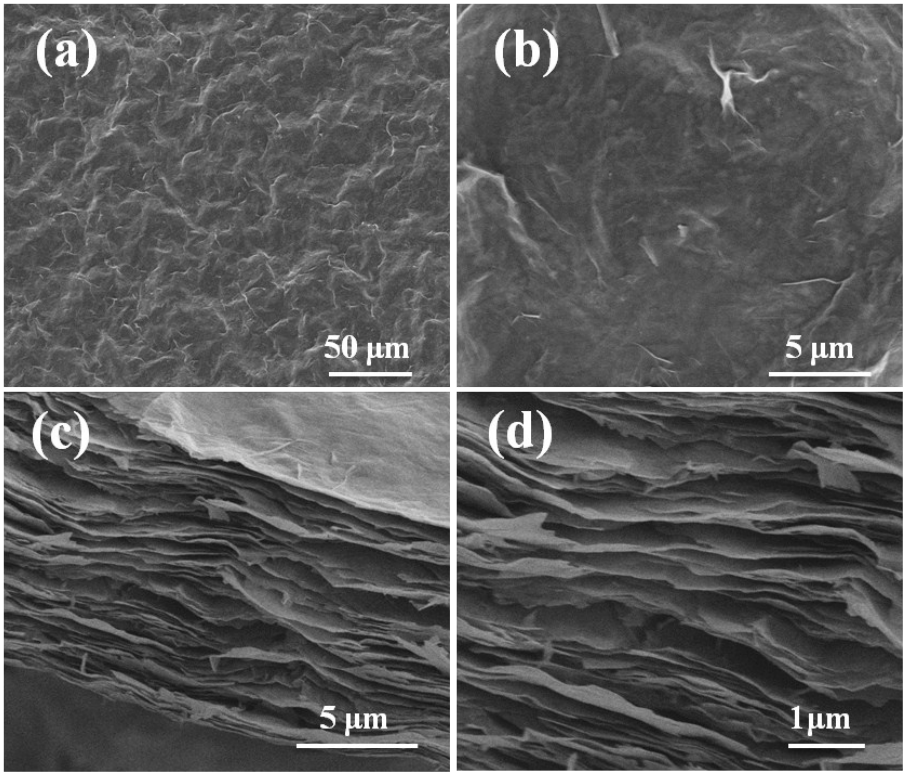

Fig. S3. Different magnifications of GN film (a, b) surface morphology, (c, d) cross section morphology.

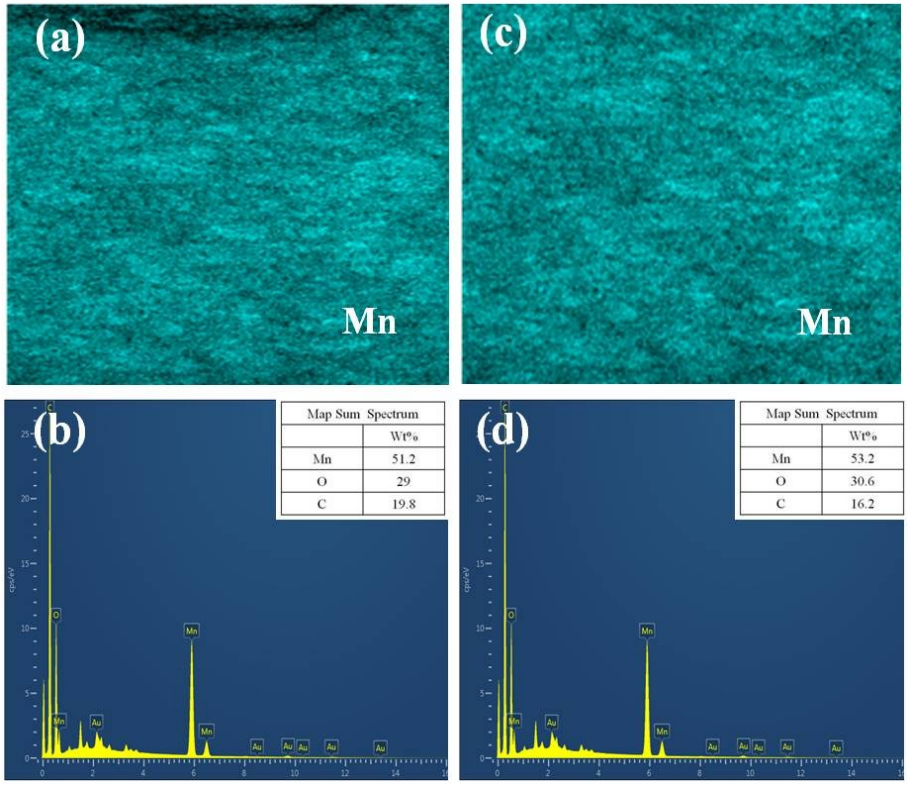

Fig. S4 The EDS mapping of Mn element and the corresponding map sum spectrum for the GN-MnO_2 film (a, b) the surface, (c, d) the bottom side