Supporting Information for

Free-standing three-dimensional graphene/manganese oxide hybrid as binder-free electrode material for energy storage applications

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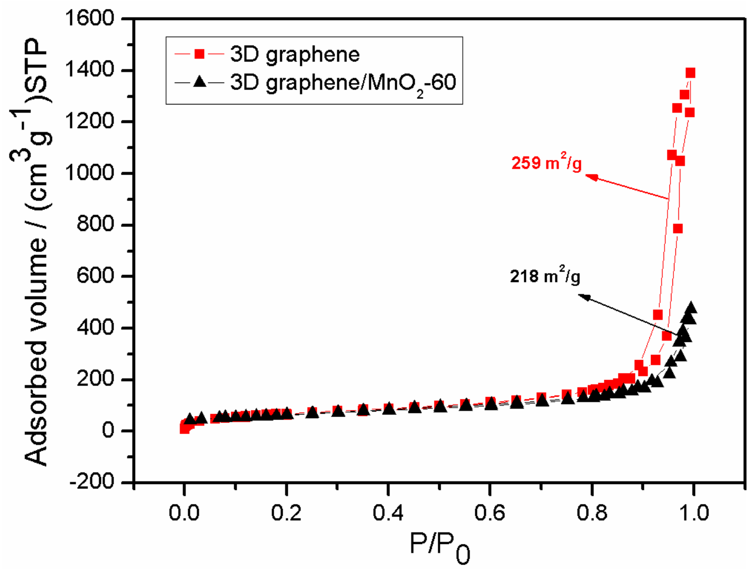

Figure S1. Nitrogen adsorption/desorption isotherms of 3D graphene and 3D graphene/MnO_2-60 samples.

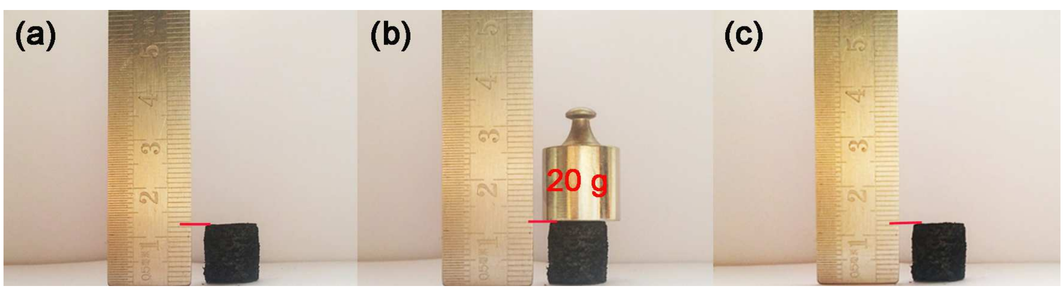

Figure S2. Digital photographs of a freestanding 3D graphene/MnO_2-60: (a) initial status, (b) supporting weight, and (c) releasing weight. The sample of 3D graphene/MnO_2-60 can endure a weight of 20 g without any damage and deformation, exhibiting the desirable strength property.

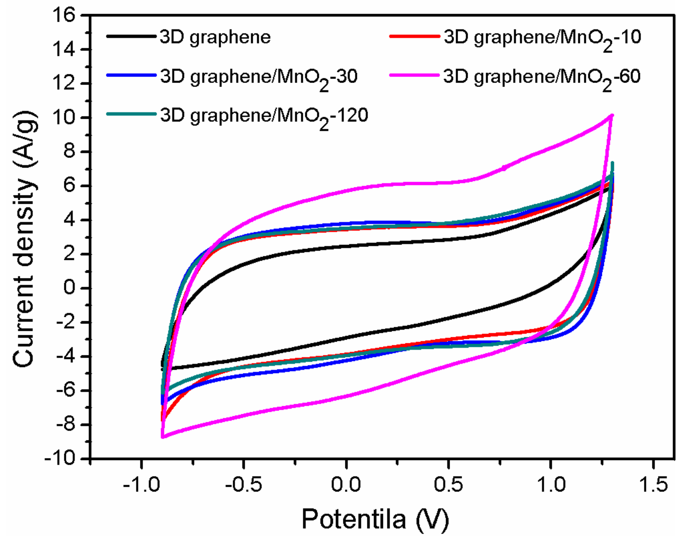

Figure S3. CVs of the 3D graphene and 3D graphene/MnO_2 hybrids prepared with different reaction times at scans rates of 50 mv/s. Among the four different 3D graphene/MnO_2 hybrids, the 3D graphene/MnO_2-60 sample displays the largest area of CV profile. It also can be seen that there is no obvious difference of the CVs between the 3D graphene/MnO_2-30 and the 3D graphene/MnO_2-120, indicating that the over-high MnO_2 loading would lead to the decrease of the specific capacitance. The results show that the 3D graphene/MnO_2-60 delivers high specific capacitance.

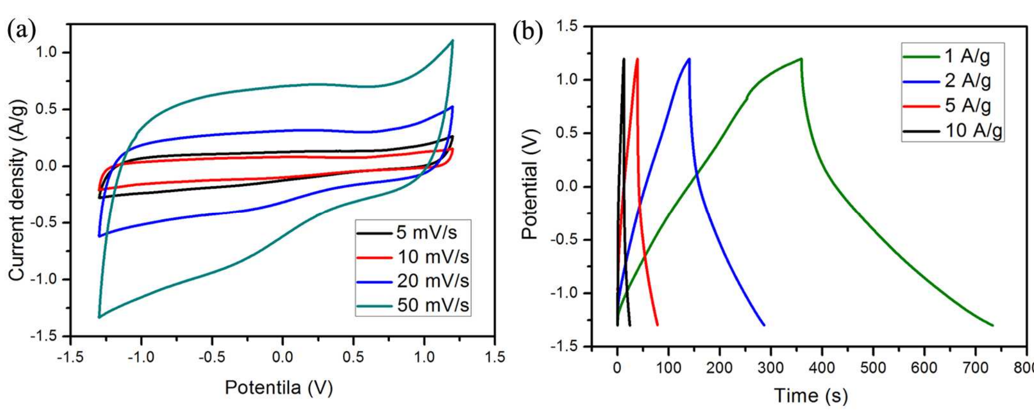

Figure S4. (a) CVs of the 3D graphene at scan rates of 5, 10, 20, and 50 mV/s. (b) Galvanostatic charging/discharging curves of the 3D graphene at different current densities. It can be seen that 3D graphene electrode shows relatively rectangular CV curves, indicating a nearly ideal supercapacitor behavior. Also, the 3D graphene electrode presents approximate symmetric charge/discharge curves and good capacitive behavior with a rapid *I-V* response. At same time, it is achieving high-capacitance performance with the specific capacitance up to 150 F/g at 1 A/g.

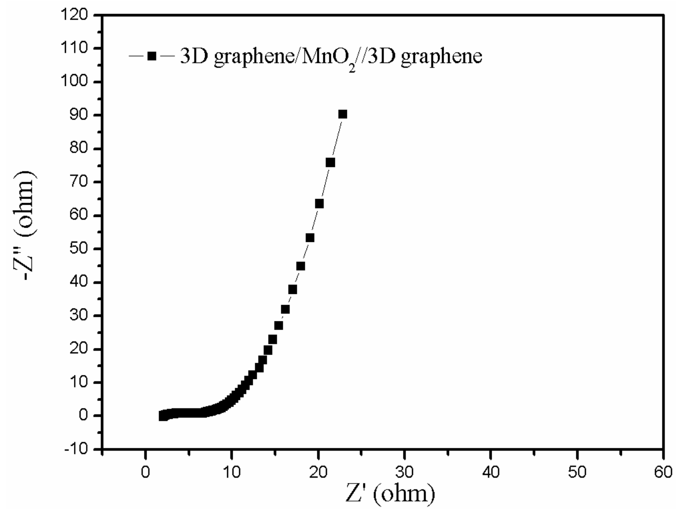

Figure S5. Nyquist plot of as-made asymmetric supercapacitor. The series resistance of the asymmetric supercapacitor is ~2.7 Ω, indicating a low internal resistance for the whole device.

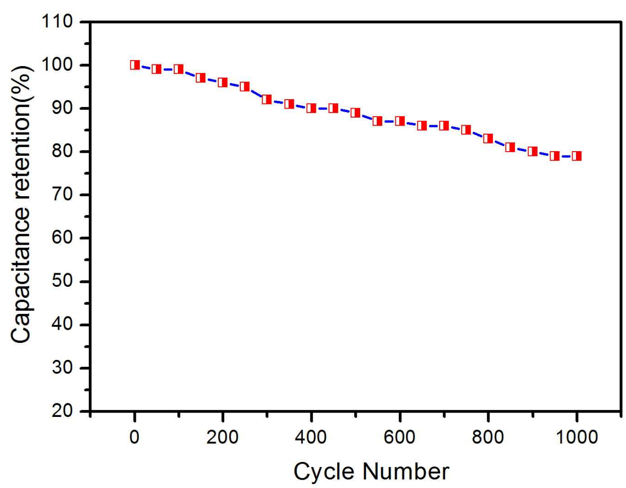

Figure S6. Cycling performance of as-made asymmetric supercapacitor testing at a current density of 10A/g. After 1000 charging/discharging cycles, the capacitance retention rates remained over 80%. The decay is mainly due to the relatively poor stability of MnO_2 in ionic liquid electrolyte.