Supporting Information

Hierarchical porous MnO/graphene composite aerogel as high-performance anode material for lithium ion batteries

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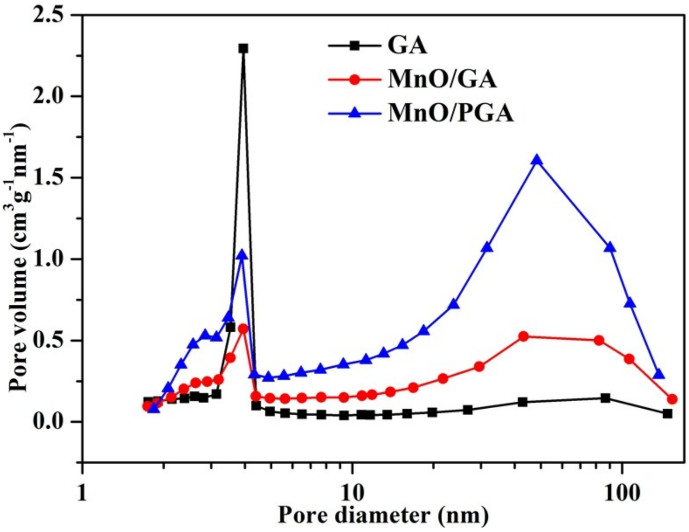

Figure S1. Pore size distribution curves of GA, MnO/GA and MnO/PGA samples.

As we can see from **Figure S1**, all three samples show the existence of pore distribution below 5 nm, which is consistent with the nanoporous nature of bare GA sample. In addition, the existence of macropores (ca. 50-70 nm) for MnO/PGA hybrid indicates the etched nanopores on the graphene sheets, agreeing with the TEM results (**Fig. 3c**). MnO/GA also displays a broadened macropore distribution ranging from 50 to 100 nm, which may be ascribed to the voids between MnO particles (ca.200 nm).

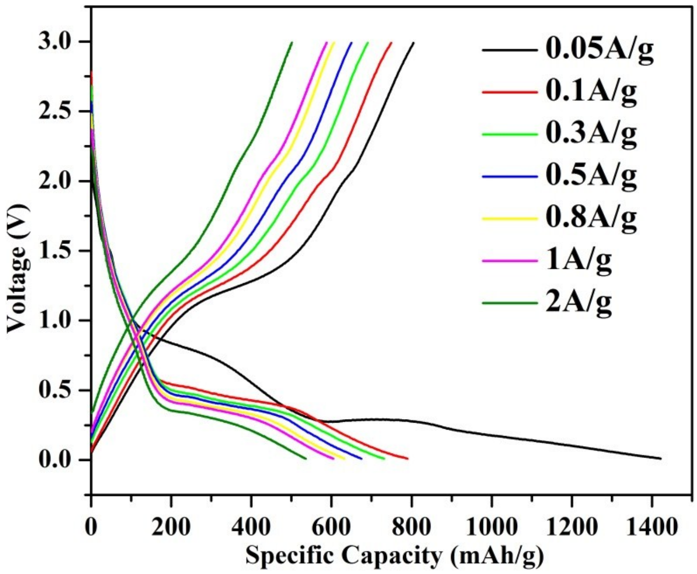

Figure S2. The charge-discharge curves of MnO/PGA sample at various current densities of 0.05 A/g, 0.1 A/g, 0.3 A/g, 0.5 A/g, 0.8 A/g, 1 A/g and 2 A/g.

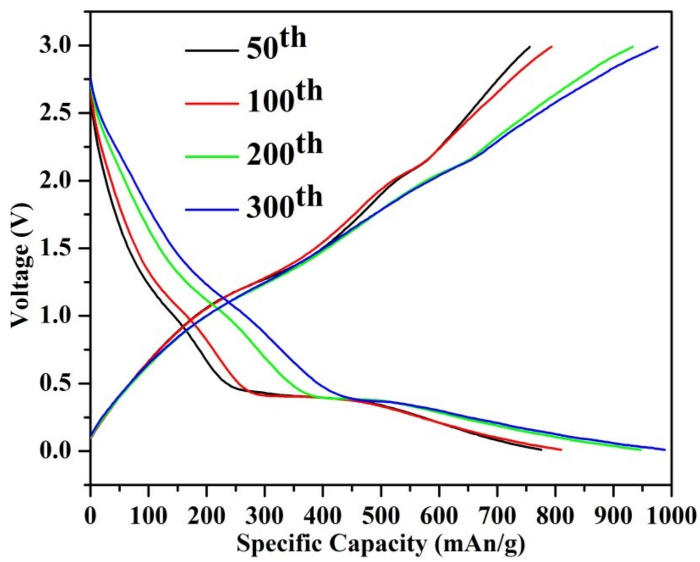

Figure S3. The typical charge-discharge curves at the 50th, 100th, 200th and 300th cycle during long-term cycles for MnO/PGA at 0.5 A/g.

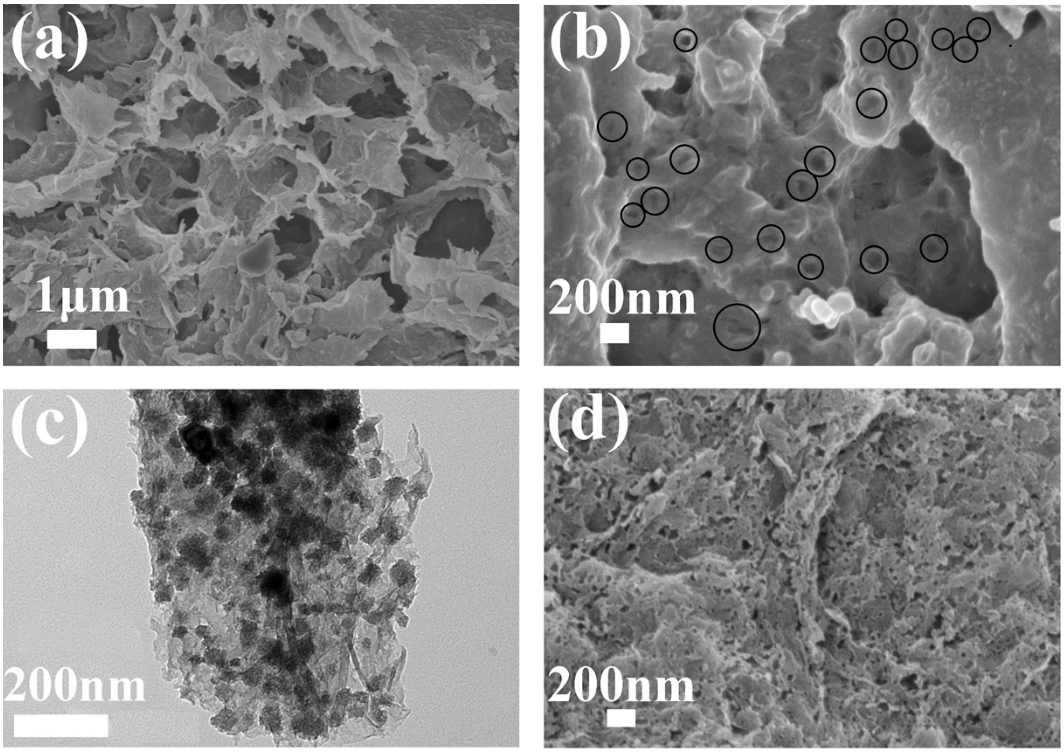

Figure S4 (a, b) Typical SEM images with different magnifications of MnO/PGA hybrid after 50 cycles at 0.5 A/g. (c) TEM image of MnO/PGA composite after 50 cycles at 0.5 A/g. (d) SEM image of MnO/PGA composite washed with HCl after 50 cycles at 0.5 A/g.

As shown in Figure S4a, the MnO/PGA hybrid maintains an integrated 3D network with continuous pores of several micrometers, which is similar to the original hybrid before cycling (Fig. 3a). Because the solid electrolyte interface (SEI) layer was generated on the surface of the hybrid during cycling, the graphene sheets become thicker after cycling. In the SEM image of MnO/PGA with higher magnification (Figure S4b), MnO particles and nanopores on the graphene sheets (marked with black circles) are also obvious. Figure S4c exhibits a TEM image for the MnO/PGA sample after cycling. MnO nanoparticles are attached to the graphene sheets uniformly, and their particle sizes remain almost the same as the ones before cycling. After removing MnO nanoparticles by HCl, a large amount of nanoholes homogenously distributing on the graphene layers are clearly seen (Figure S4d). These results indicate that the structural integrity of MnO/PGA electrode can be maintained during cycling, thereby leading to excellent electrochemical performance.