Supporting information for

Few-layers MoS$_2$ anchored Graphene Aerogel Paper for Free-Standing Electrode Materials

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Figure S1 High resolution C 1s XPS of a) pristine graphene oxide (obtained directly from freeze-dried), and b) MGAP

Figure S2 Survey TEM of MGAP
Figure S3  TGA analysis of pristine MoS$_2$, MrGO, and MGAP (10 °C min$^{-1}$ to 700 °C under O$_2$ environment)

MGAP has a surface area of ca. 5.5 m$^2$ g$^{-1}$ based on the BET result. Figure S4a shows the N$_2$ adsorption/desorption isotherm curve for MGAP, and it portrays a type IV hysteresis loop which is indicative of the presence of mesopores in sample. The pore distribution as shown in Figure S4b reveals a large pore size distribution of MGAP, which majority are in the mesopores range. The low BET surface area of MGAP is due to the increase in density of the aerogel (mechanical compression, and addition of MoS$_2$, 48 wt %) [S1], and the fusion of mesopores to form macropores due to the gradual growth of ice crystals during freeze-drying [S2].
Tensile test was performed on MGAP using Instron 5548 micro tester. The sample displayed a plateau at tensile pressure of 13 MPa, which was later increased to an ultimate tensile pressure of 25 MPa. Such phenomenon may be due to the multi-layered structure of the fabricated sample. During the plateau, the various graphene oxide layers started to fail while continuing its elongation. Finally at tensile strain of 3 %, the pressure increased to fracture the remaining graphene oxide layers.

**Figure S6** SEM images of MGAP with thickness a) 67 µm, and b) 147 µm
Figure S7 First 5 CV curves of MGAP with thickness a) 67 µm, and b) 147 µm

Figure S8 Galvanostatic charge/discharge profiles of MGAP with thickness 67 µm (blue), and 147 µm (orange)

References


[S2] Xuetong Zhang, Zhuyin Sui, Bin Xu, Shufang Yue, Yunjun Luo, Wanchu Zhan, and Bin Liu, *J. Mater. Chem.*, 2011, 21, 6494