Supporting Information

# Nano-graphite Functionalized Mesocellular Carbon Foam with Enhanced Intra-penetrating Electrical Percolation Networks for High Performance Electrochemical Energy Storage Electrode Materials

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**Table S1.** EDLC performance of various mesoporous carbon materials.

| Type of carbons | Surface area/ $m^2\ g^{-1}$ | Capacitance / $F\ g^{-1}$ | Electrolyte | Reference |
|---|---|---|---|---|
| SOMC (Short pore length ordered mesoporous carbon) | 1179 (3.9 nm pores) | 127 (at 5 mV $s^{-1}$) | 6 M KOH | H.-Q. Li et al. *J. Electrochem. Soc.*, 154, A731 (2007) |
| LOMC (Long pore length ordered mesoporous carbon) | 1362 (3.8 nm pores) | 113 (at 5 mV $s^{-1}$) | 6 M KOH | H.-Q. Li et al. *J. Electrochem. Soc.*, 154, A731 (2007) |
| CMK-3 (Mesoporous carbon, 2-dimensional hexagonal structure) | 984 (4 nm pores) | 115 (at 2 mV $s^{-1}$) | 6 M KOH | K. Xia et al. *Carbon*, 46, 1718 (2008) |
| MSU-F-C (Mesocellular carbon) | 928 (4 & 28nm pores) | 109 (at 4 mV $s^{-1}$) | 2 M $H_2SO_4$ | This work |
| MSU-F-C-G (Graphite functionalized mesocellular carbon) | 394 (28 nm pores) | 93 (at 4 mV $s^{-1}$) | 2 M $H_2SO_4$ | This work |

**Table S2.** Lithium ion battery anode performance of mesoporous carbon materials.

| Type of carbons | Surface area/ $m^2\ g^{-1}$ | Reversible capacity / $mAh\ g^{-1}$ | ΔV | Initial coulombic efficiency / % (ratio of discharge/charge) | Reference |
|---|---|---|---|---|---|
| Tir-OMC (Mesoporous carbon, 2-dimensional hexagonal structure) | 2390 (6.7 nm pores) | 1048 (500 mAh $g^{-1}$ after 50 cycles) | 0.01 - 3 | 34 | H.-Q. Li et al. *Carbon* 45, 2628 (2007) |
| CMK-3 (Mesoporous carbon, 2-dimensional hexagonal structure) | 1147 (4 nm pores) | 1100 – 850 in 20 cycles | 0.01 - 3 | 34 | H. Zhou et al. *Adv. Mater.*, 15, 2107 (2003) |
| MSU-F-C (Mesocellular carbon) | 928 (4 & 28nm pores) | 624 (99 % retention after 50 cycles) | 0 – 2.5 | 27.5 | This work |
| MSU-F-C-G (Graphite functionalized mesocellular carbon) | 394 (28 nm pores) | 581 (93 & retention after 50 cycles) | 0 – 2.5 | 43.6 | This work |

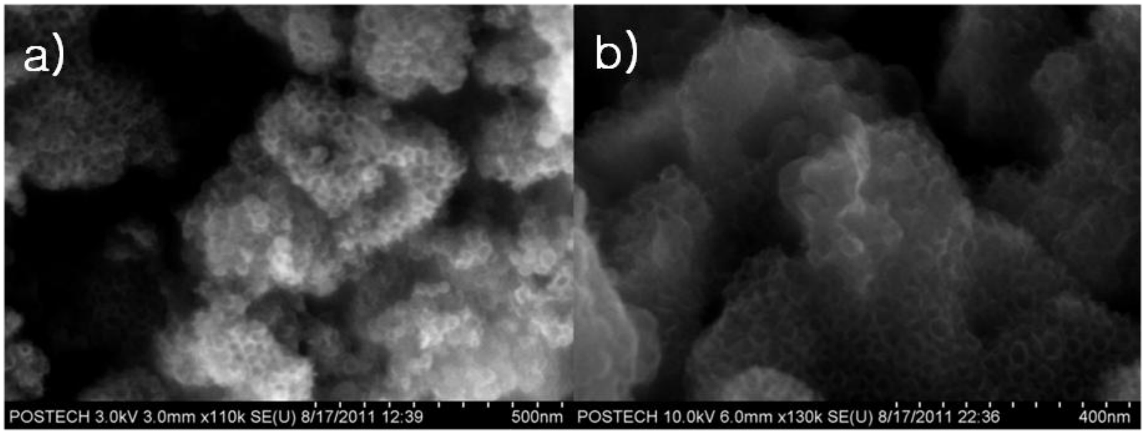


**Figure S1.** SEM images of (a) MSU-F-C and (b) MSU-F-C-G. The particle shape did not change after functionalization of the nanographite on MSU-F-C.

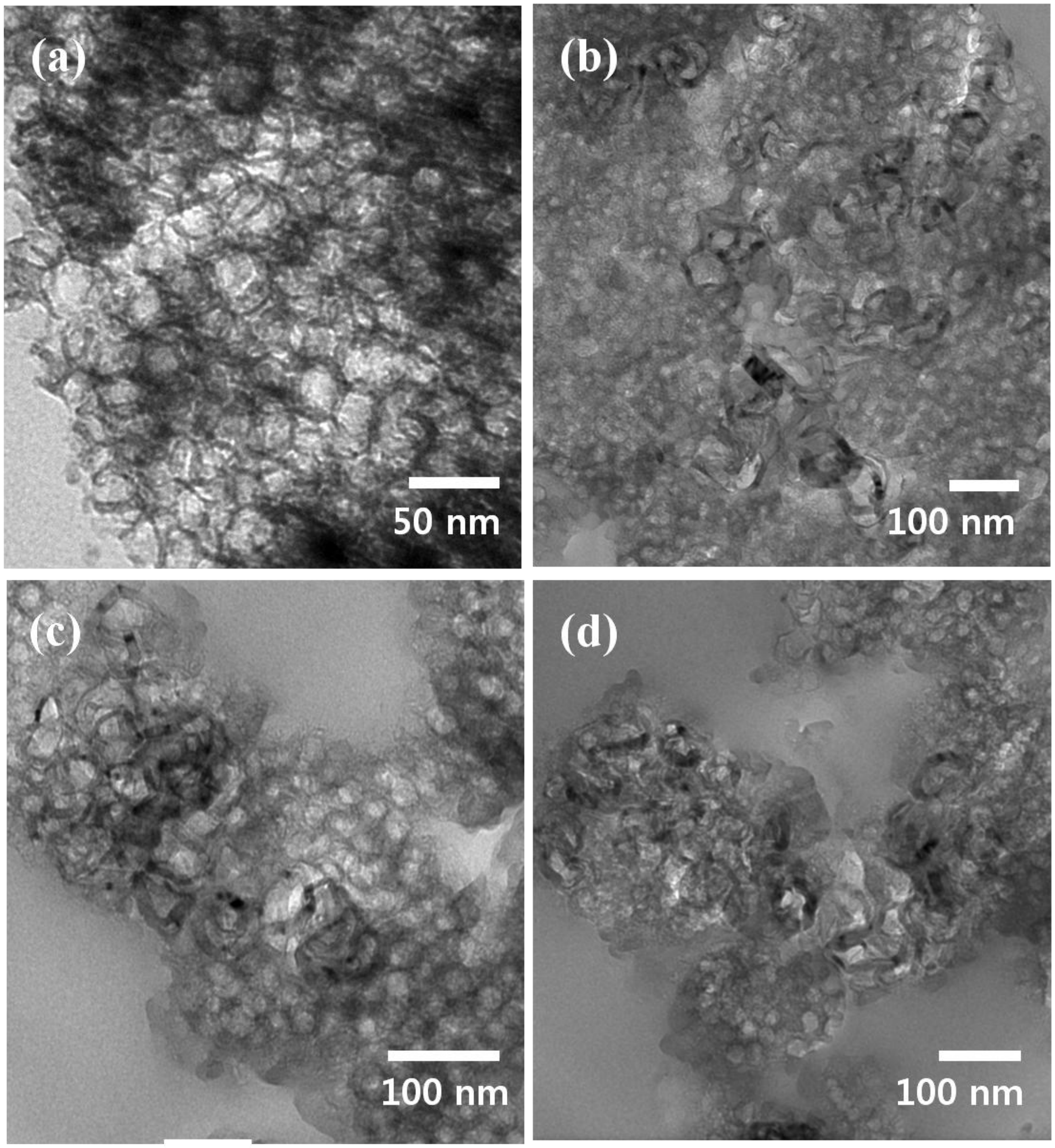


**Figure S2.** TEM images of (a) MSU-F-C and (b)-(d) MSU-F-C-G.

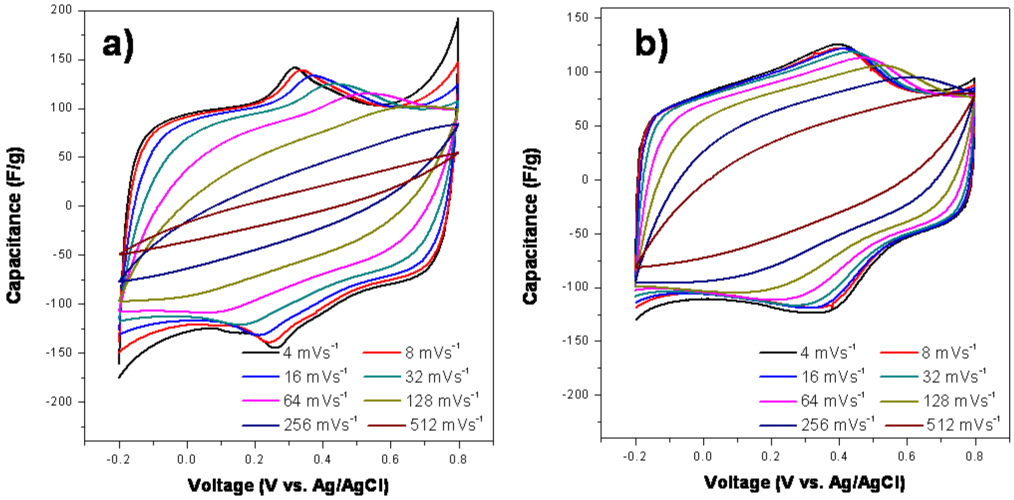


**Figure S3.** Capacitance-voltage profiles of (a) MSU-F-C and (b) MSU-F-C-G obtained from cyclic voltammograms. The large time constant($\tau$ = ESR × C ) of the MSU-F-C electrode distorts the rectangular shaped response of the current under high scan rate conditions. On the other hand, the enhanced electrical conductivity of the MSU-F-C-G material results in a better capacitance retention under high scan rate conditions.

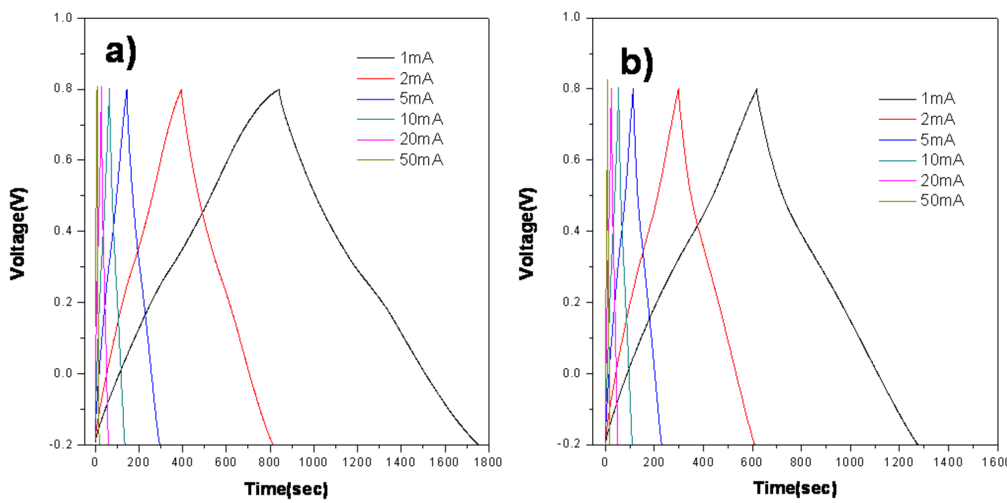


**Figure S4.** Galvanostatic charge/discharge graphs of (a) MSU-F-C, and (b) MSU-F-C-G within the potential range, -0.2 to 0.8V for various current rates (1 – 50 mA/cm$^{-2}$)

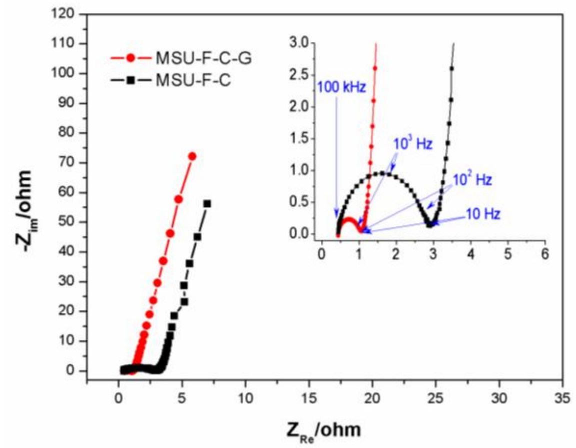


**Figure S5.** Nyquist plots of MSU-F-C and MSU-F-C-G at 0.2 V. (Inset : magnified view.)

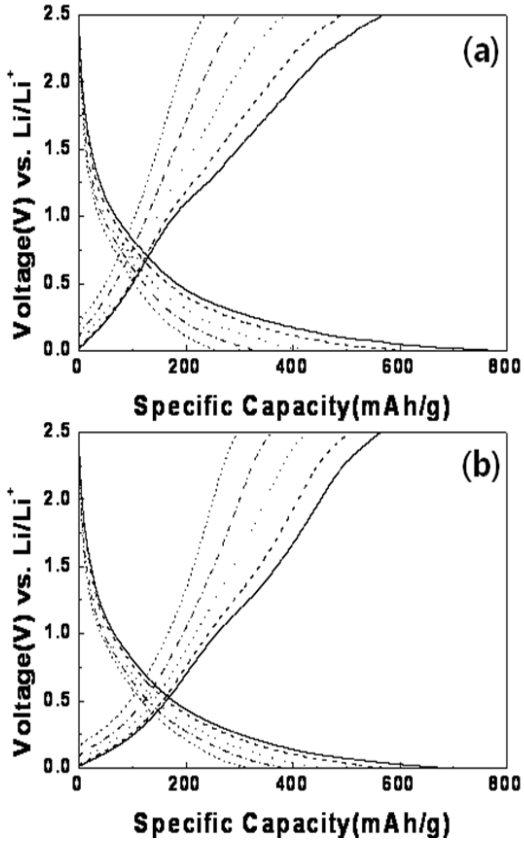


**Figure S6.** Change of the galvanostatic charge-discharge patterns of the (a) MSUF-F-C and (b) MSU-F-C-G anodes according to an applied current of 0.1 (solid), 0.2 (dashed), 0.5 (dotted), 1 (dash-dotted) and 2 C (short-dashed).

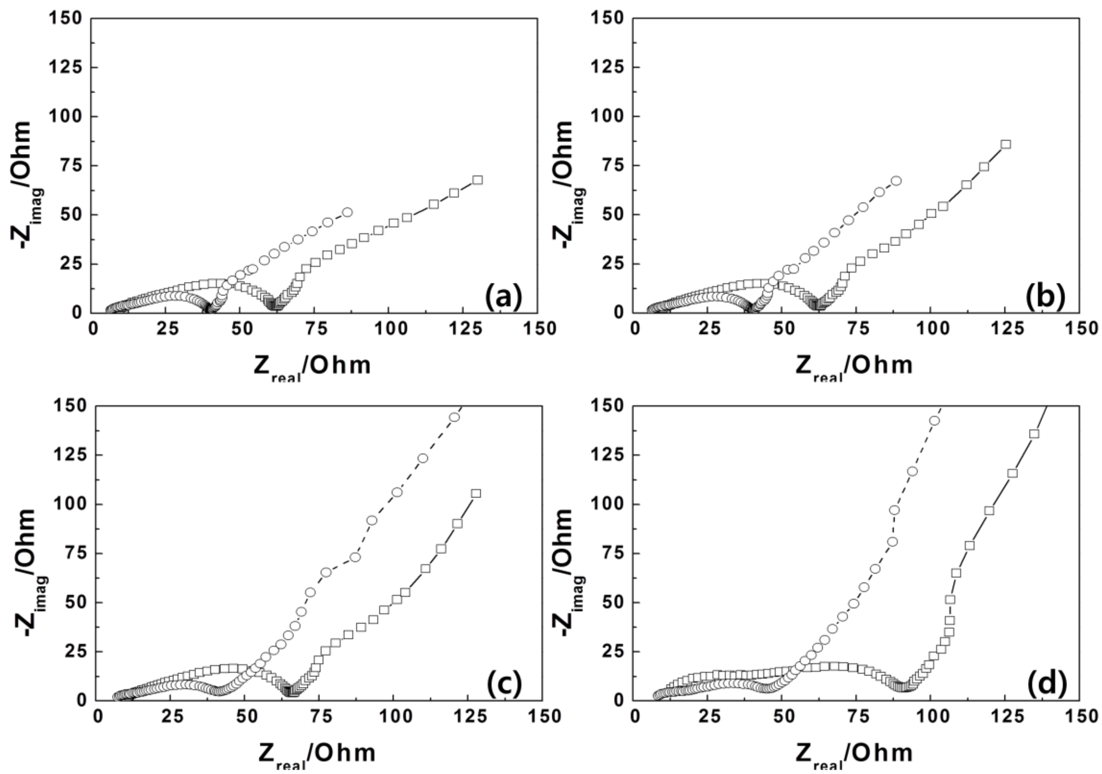


**Figure S7.** Electrochemical impedance spectra of the MSU-F-C (rectangles) and MSU-F-C-G (circles) anodes expressed as Nyquist plots according to measuring potentials of (a) 0, (b) 0.5, (c) 1.0 and (d) 2.0 V vs. $Li/Li^+$.