Supporting Information

High-Rate Electrochemical Capacitors from Highly Graphitic Carbon–Tipped Manganese Oxide/Mesoporous Carbon/ Manganese Oxide Hybrid Nanowires

Hao Jiang,[ab] Liping Yang,[b] Chunzhong Li,*[a] Chaoyi Yan,[c] Pooi See Lee,[c] Jan Ma[ab]

[a] Key Laboratory for Ultrafine Materials of Ministry of Education, School of Materials Science and Engineering, East China University of Science & Technology, Shanghai 200237, China

[b] Temasek Laboratories, Nanyang Technological University, Singapore 637553, Singapore

[c] School of Materials Science and Engineering, Nanyang Technological University, Singapore 639798, Singapore

* Electronic mail: czli@ecust.edu.cn (Prof. Chunzhong Li) and asjma@ntu.edu.sg (Prof. Jan Ma);

Part I: Supplementary Figures

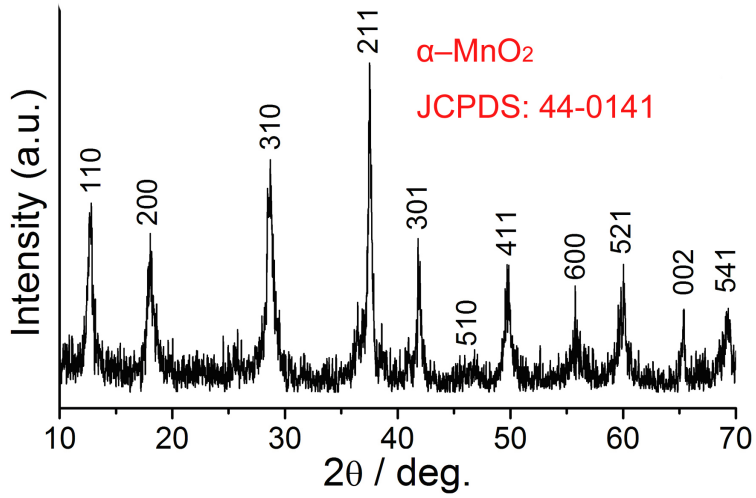

Figure S1 The XRD pattern of the as-synthesized MnO_2 nanowires. All of the diffraction peaks can be indexed to the α–MnO_2 phase (JCPDS, file No.: 44-0141), and no other characteristic peaks from impurities are detected in the spectrum. This demonstrates the high purity of the products.

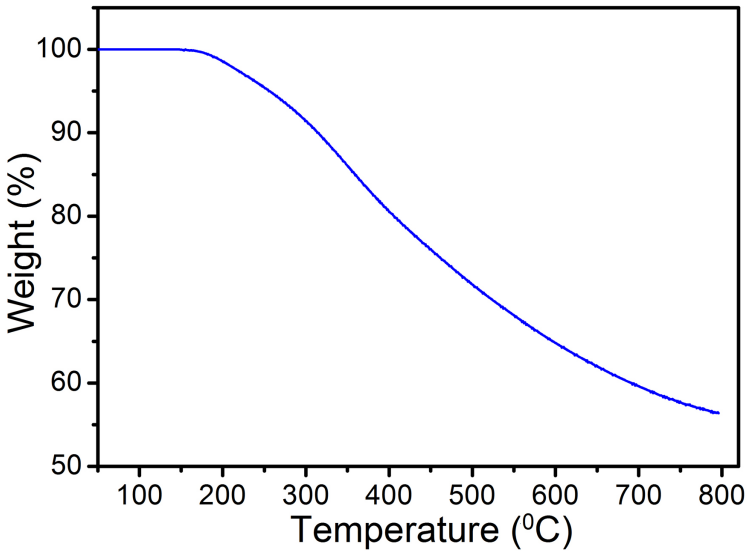

Figure S2 TGA curve of polydopamine in inert atmosphere. Even the temperature up to 800 °C, the sample still keep about 54% of the total weight, suggesting that polydopamine can be carbonized under inert atmosphere.

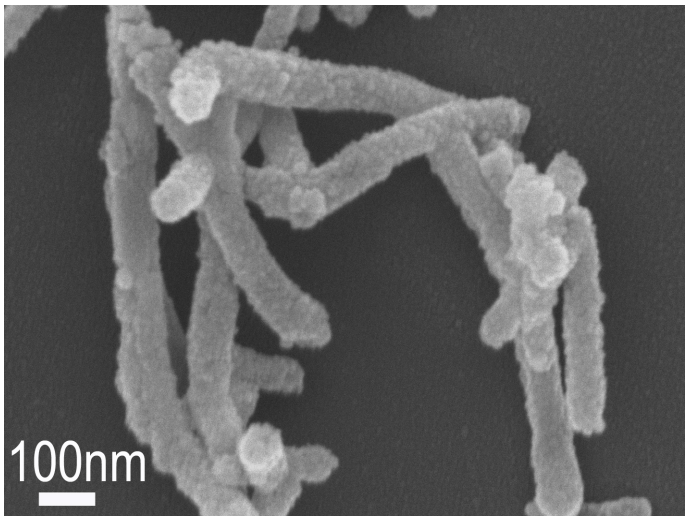

Figure S3 The SEM image of MCM hybrid nanowires. The sample shows the similar morphology as the MMCM hybrid nanowires.

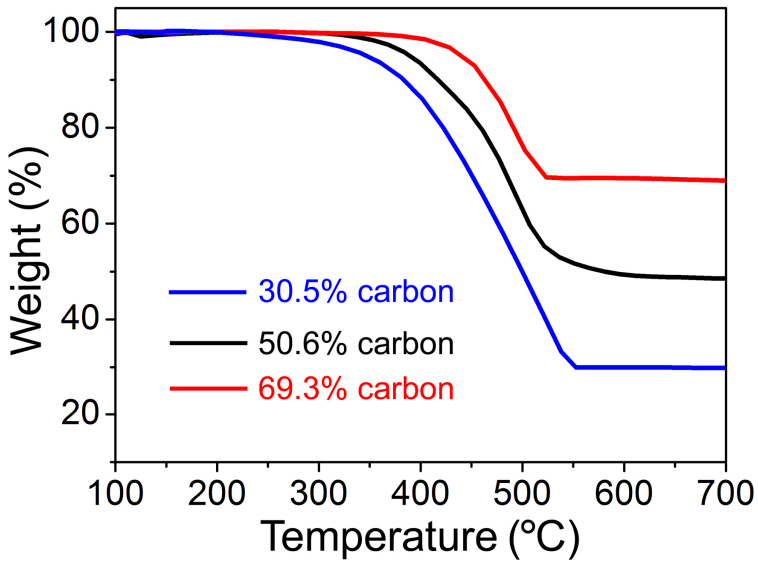

Figure S4 The TG curves of the MMCM hybrid nanowires with different carbon content.

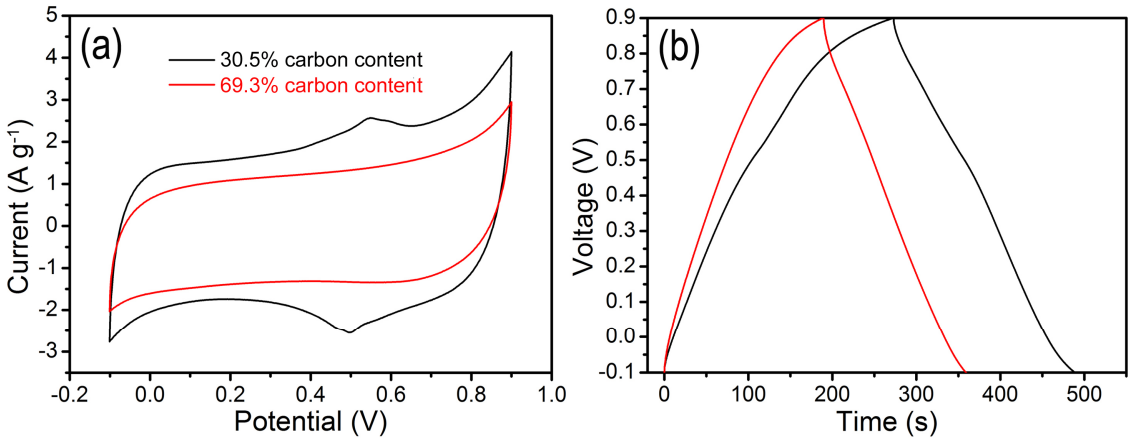

Figure S5 (a) the CV curves at a scan rate of 10 mV s^{-1} and (b) constant charge-discharge curves at a current density of 1 A g^{-1} of the MMCM hybrid nanowires with 30.5% and 69.3% of carbon content, respectively.

Part II: Calculations

The specific capacitance was calculated from the CV curves according to the following equation:

$$C = Q/(\Delta Vm),$$

where C (F g^{-1}) is the specific capacitance, m(g) is the mass of the active materials, Q(C) is the average charge during the charging and discharging process, and ΔV(V) is the potential window.

The discharge specific capacitance could also be calculated from the discharge curves by the following equation:

$$C = I\Delta t/(m\Delta V),$$

where I(A), Δt(s), m(g) and ΔV(V) are the discharge current, discharge time consumed in the potential range of ΔV, mass of the active materials (or mass of the total electrode materials), and the potential windows, respectively.

The energy density (E) and power density (P) were calculated by the following equations:

$$E = C(\Delta V)^2/2,$$

$$P = E/\Delta t$$

where C is the specific capacitance of the active materials, and ΔV is the potential window of discharge.