Supporting Information for

Graphene-Wrapped Mesoporous MnCO$_3$ Single Crystals Synthesized from Dynamic Floating Electrodeposition Method for High Performance Lithium-ion Storage

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§M. Gao and X. Cui contribute equally to this work.

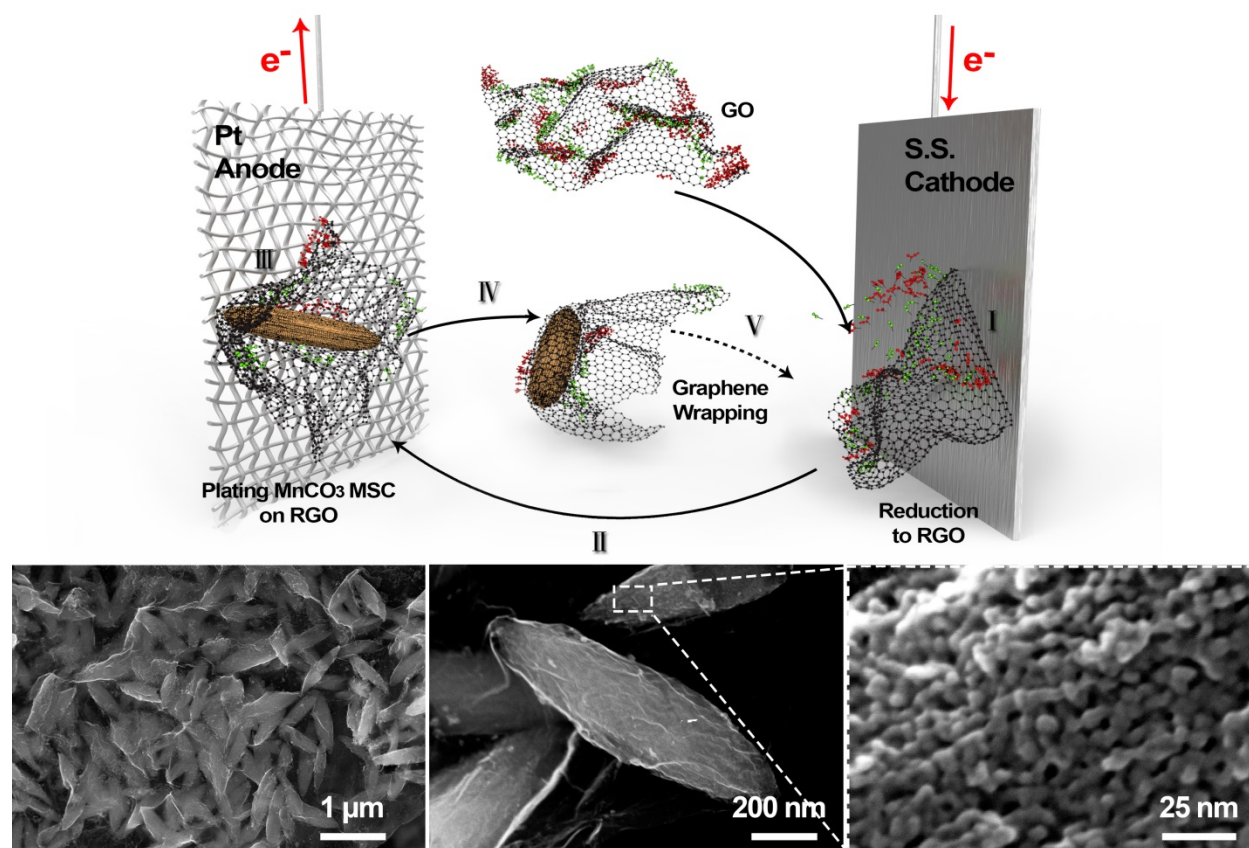*Address Correspondence weixing.chen@ualberta.ca or xinwei.cui@adven-solutions.com.

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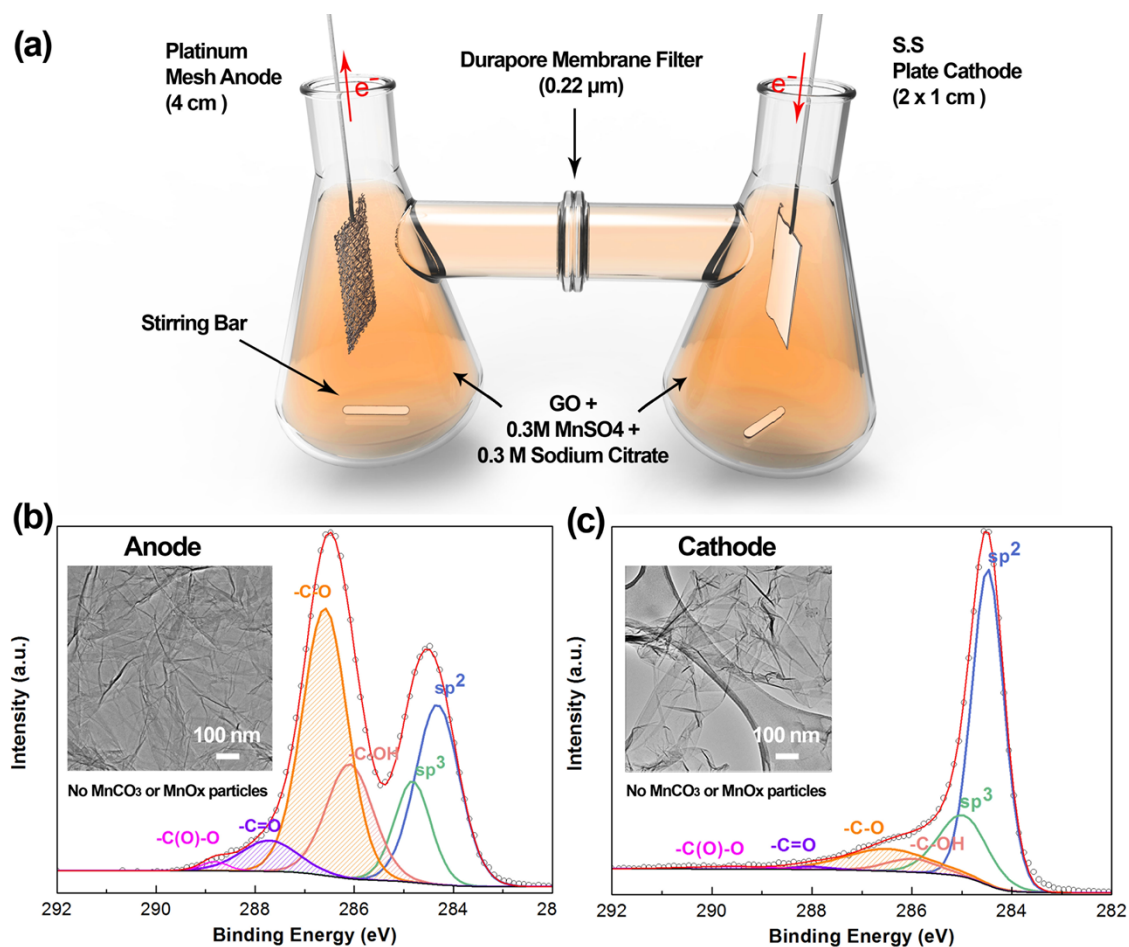
1. Control experiment I

Figure S1. (a) The setup of the comparative experiment, in which the electrolyte was separated by a membrane at the center. All other parameters were controlled exactly the same as those in DFE method in Figure 1a. (b) XPS and (c) TEM analyses of the products collected from anode and cathode.
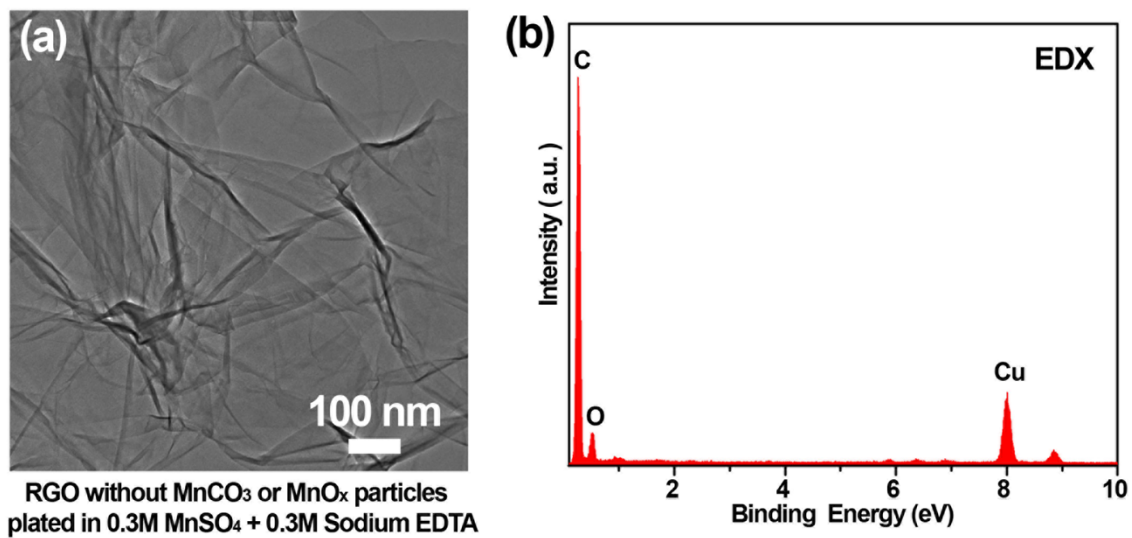
2. Control experiment II

RGO without MnCO₃ or MnOₓ particles
plated in 0.3M MnSO₄ + 0.3M Sodium EDTA

Figure S2. TEM and EDX analyses of the products collected from the plating solution of 0.3 M MnSO$_4$ and 0.3 M sodium EDTA. All other parameters were controlled exactly the same as those in DFE method in Figure 1a.

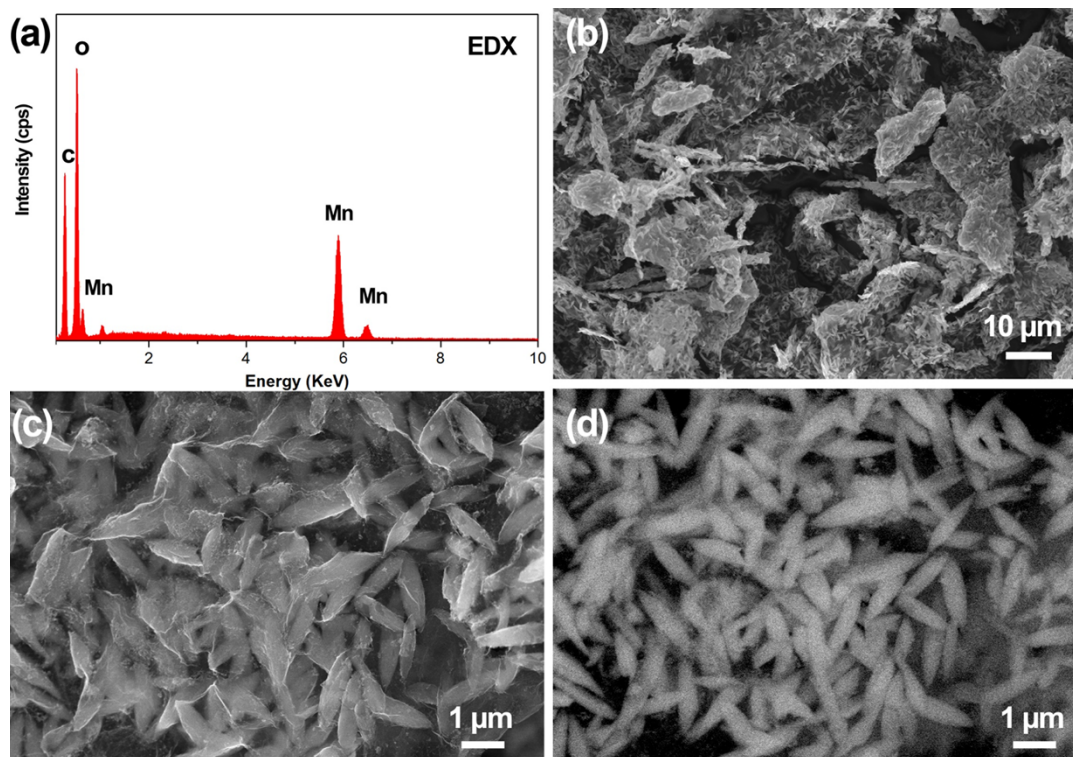## 3. More SEM and EDX results of graphene-wrapped MnCO₃ MSCs

Figure S3. (a) EDX analysis and (b) SEM image of graphene-wrapped MnCO₃ MSCs. (c) Secondary and (d) back-scattered SEM images taken from the same location of the novel composite.
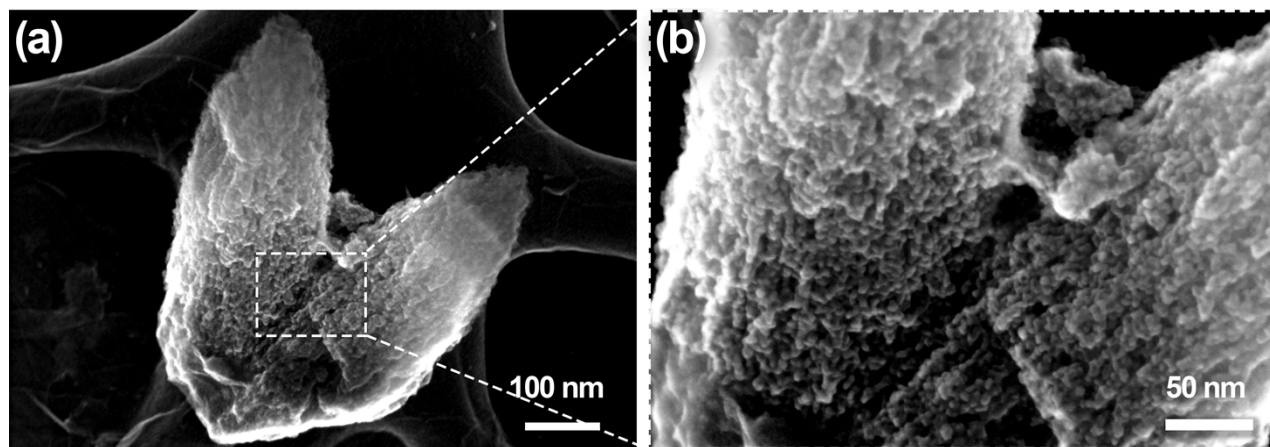

Figure S4. Cross-sectional SEM images of MnCO₃ MSCs.
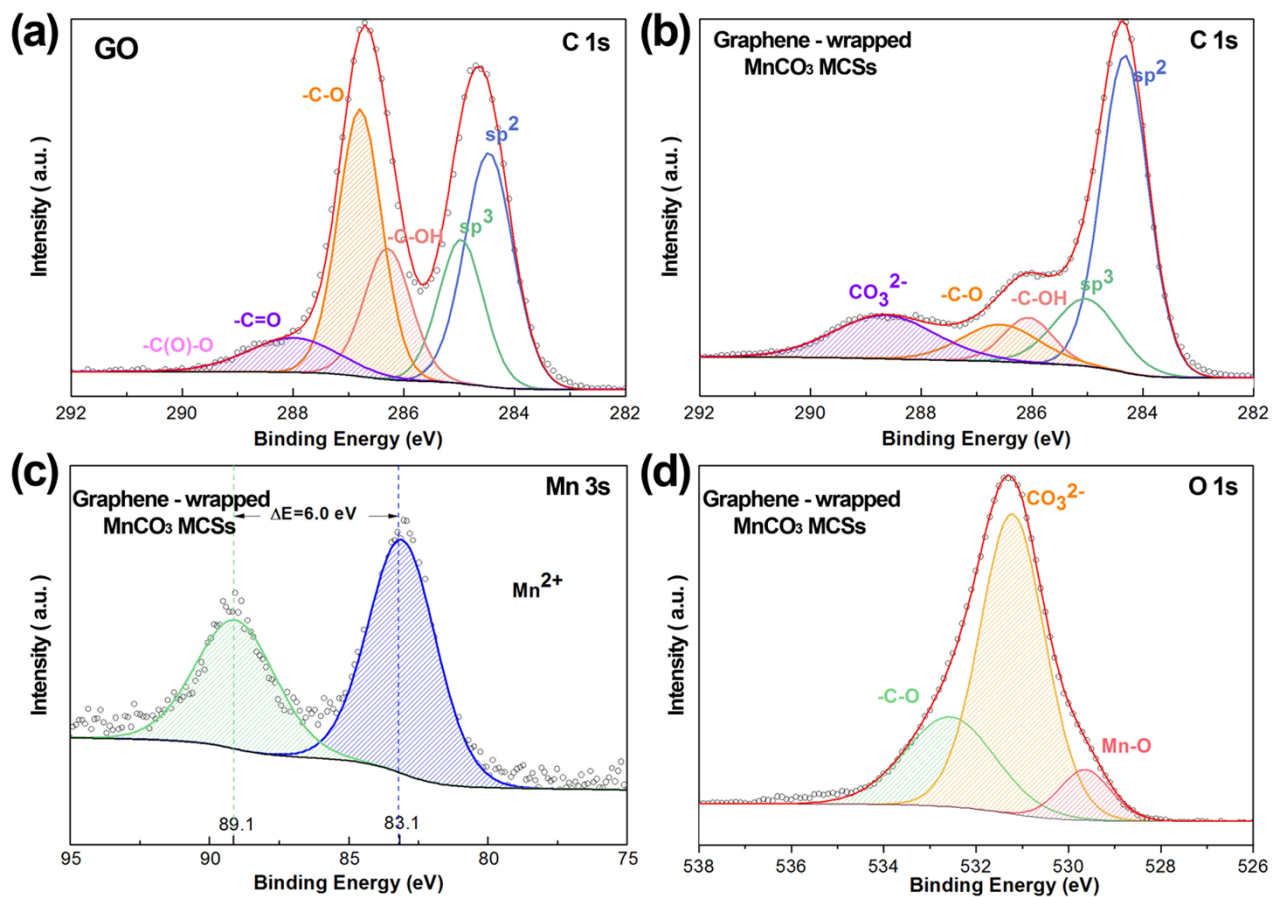
4. More XPS data

Figure S5. XPS analyses of GO (a) C1s and (b) C1s, (c) Mn 3s, and (d) O 1s of graphene-wrapped MnCO₃ MSCs.

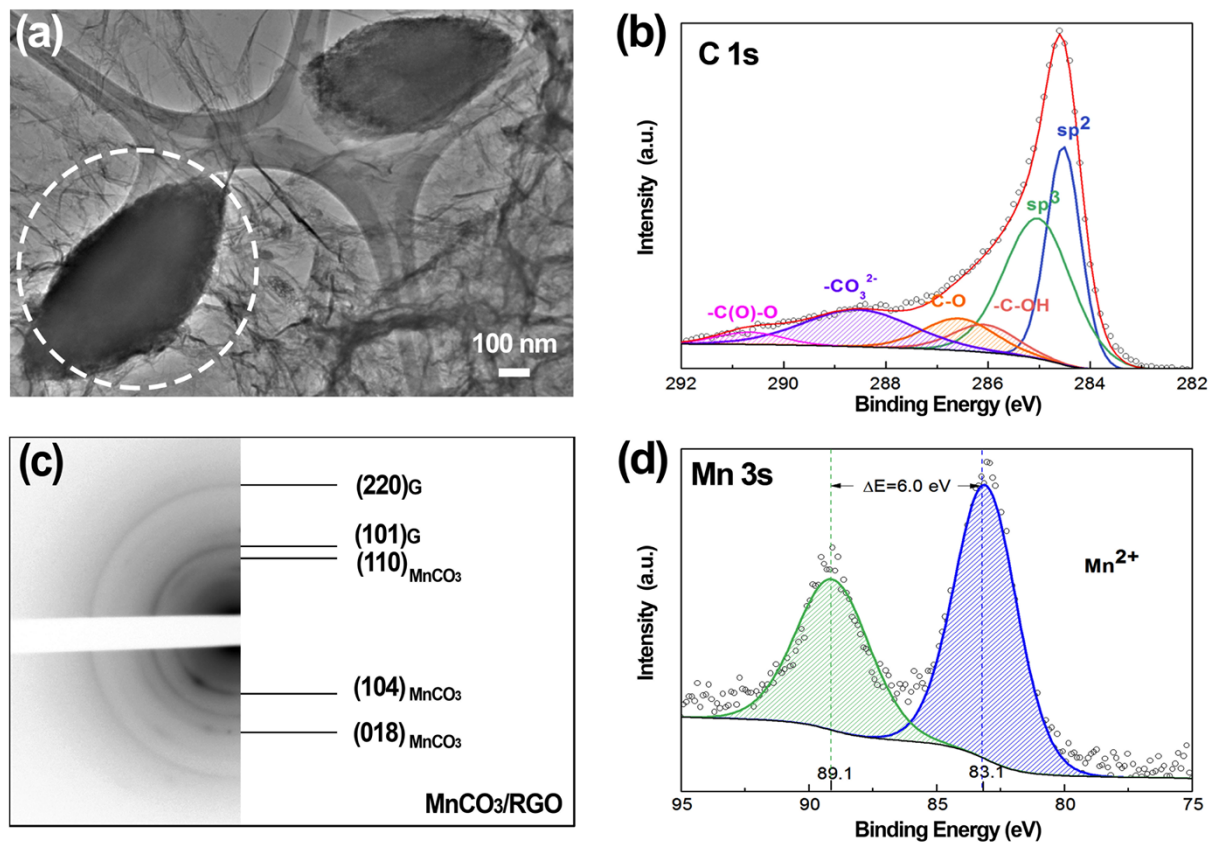# 5. Nanocrystalline MnCO₃ with RGO (nc-MnCO₃-RGO)

Figure S6. (a) TEM image, XPS spectra of (b) C 1s and (d) Mn 3s of nc-MnCO₃-RGO composite, (c) electron diffraction from the selected area in the white circle in (a).

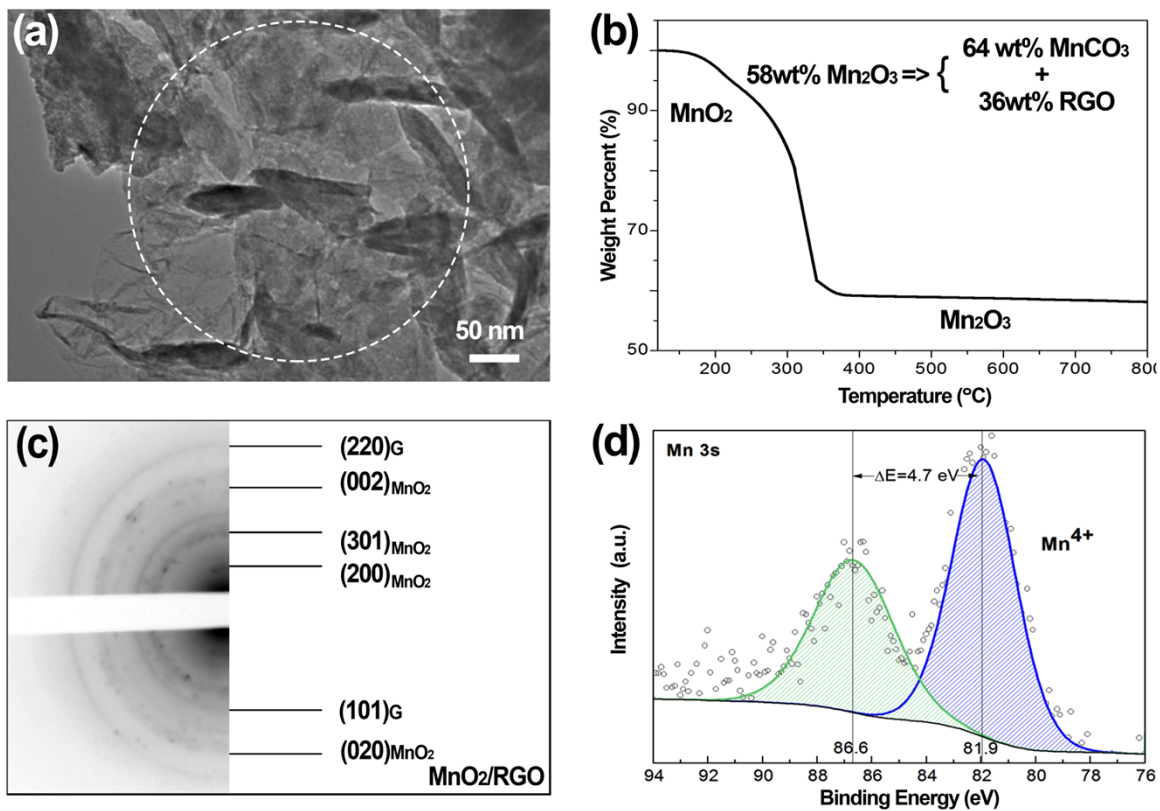# 6. Nanoflake MnO$_2$ with RGO (nano-MnO$_2$-RGO)

Figure S7. (a) TEM image, (b) TGA, (c) electron diffraction from the selected area in the white circle in (a). (d) XPS spectrum of Mn 3s of nano-MnO$_2$-RGO composite.
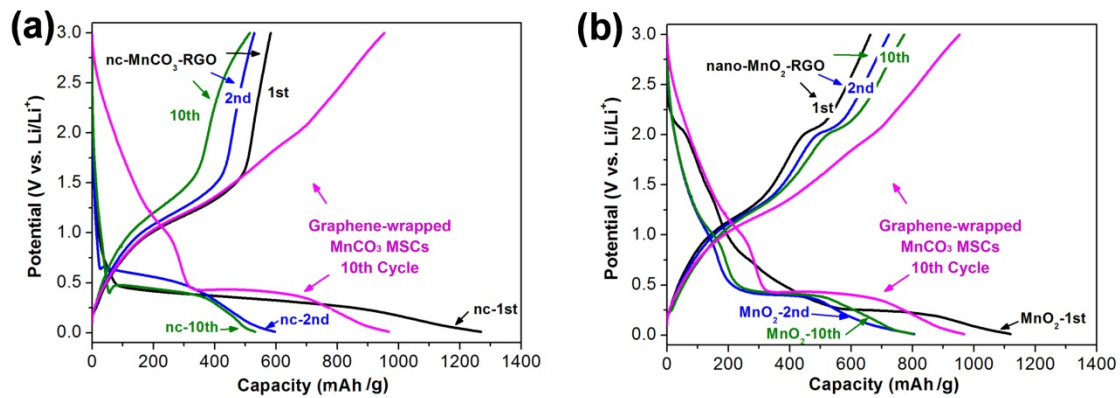
7. More electrochemical data

Figure S8. The 1st, 2nd and 10th activation charging-discharging curves of (a) nc-MnCO₃-RGO and (b) nano-MnO₂-RGO, compared with the 10th activation cycle of graphene-wrapped MnCO₃ MSCs.

8. Characterization of graphene-wrapped MnCO$_3$ MSCs and nc-MnCO$_3$-RGO after hundreds of cycles
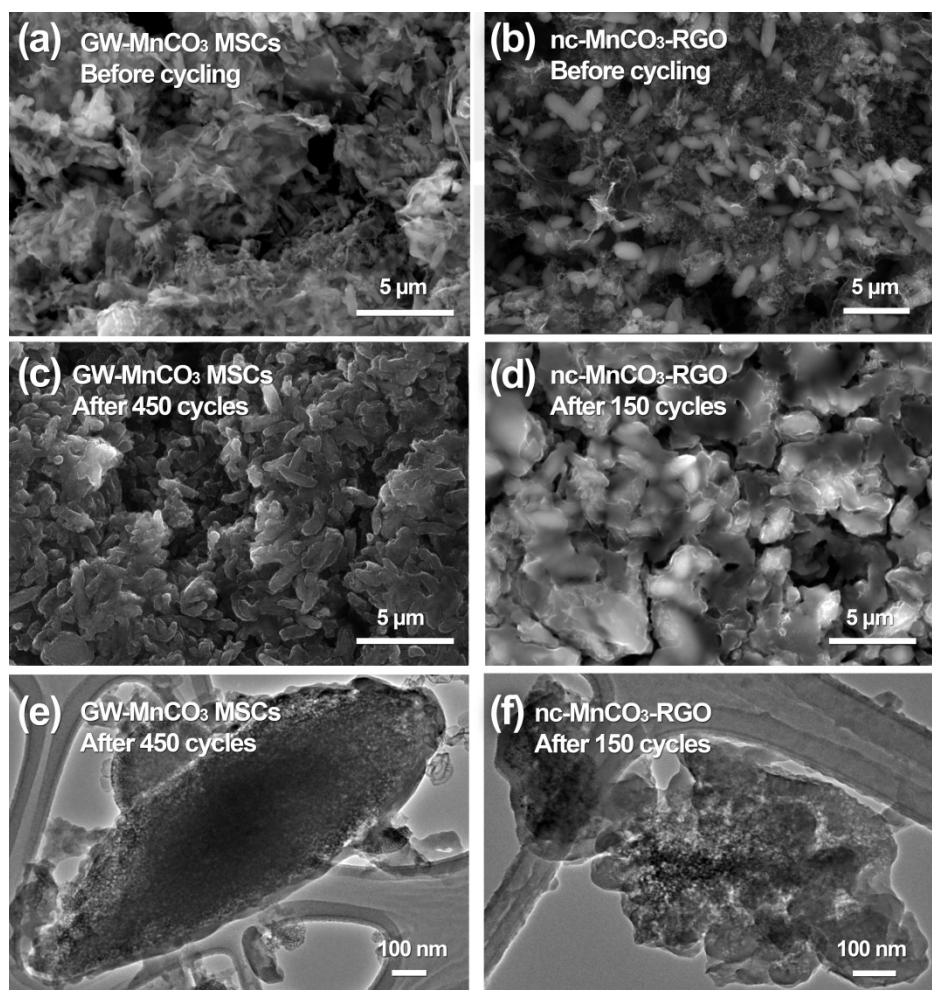

Figure S9. SEM and TEM images of graphene-wrapped (GW) MnCO$_3$ MSCs and nc-MnCO$_3$-RGO before and after cycles.