Supplementary Material (ESI) for Physical Chemistry Chemical Physics
This journal is (c) The Royal Society of Chemistry 2012

Supporting Information

# Enhancement of electrocapacitive performance of manganese dioxide by introduction of microporous carbon sphere network

Wei Wei,[a] Xiaobin Huang,[*a] Yiming Tao,[b] Kuiyong Chen[a] and Xiaozhen Tang[a,c]

[a]School of Chemistry and Chemical Engineering, Shanghai Jiao Tong University, Shanghai 200240, People's Republic of China

[b]School of Materials Science and Engineering, Shanghai Jiao Tong University, Shanghai 200240, People's Republic of China

[c]National Key Laboratory of Metallic Matrix Composite Material, Shanghai Jiao Tong University, Shanghai 200240, People's Republic of China

*Corresponding author: School of Chemistry and Chemical Engineering, Shanghai Jiao Tong University, Shanghai 200240, People's Republic of China

Tel.: +86 21 54743264

Fax: +86 21 54741297

E-mail address: xbhuang@sjtu.edu.cn (X. Huang)

Supplementary Material (ESI) for Physical Chemistry Chemical Physics
This journal is (c) The Royal Society of Chemistry 2012

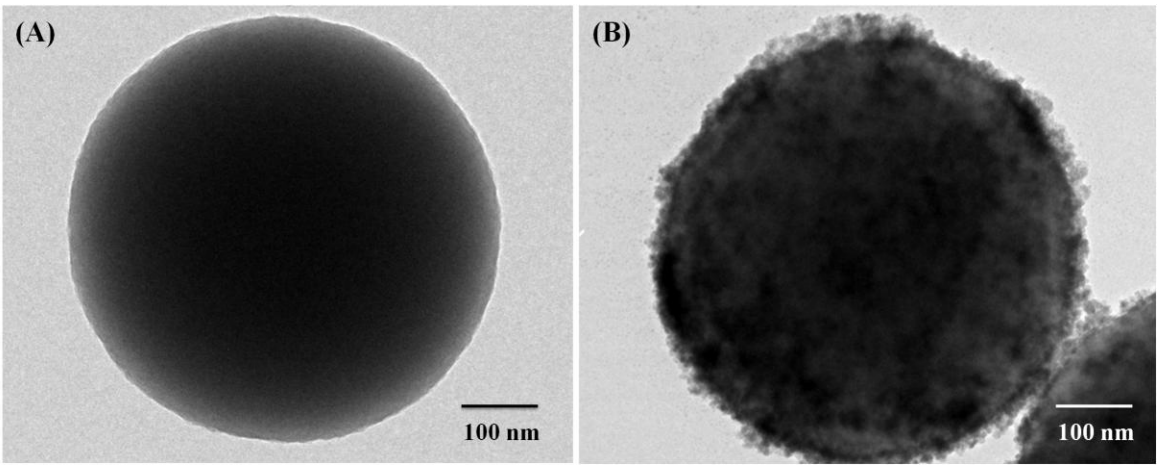


**Fig. S1** TEM images of (A) MCS and (B) α-$MnO_2 \cdot nH_2O$/25 wt% MCS.

Supplementary Material (ESI) for Physical Chemistry Chemical Physics
This journal is (c) The Royal Society of Chemistry 2012

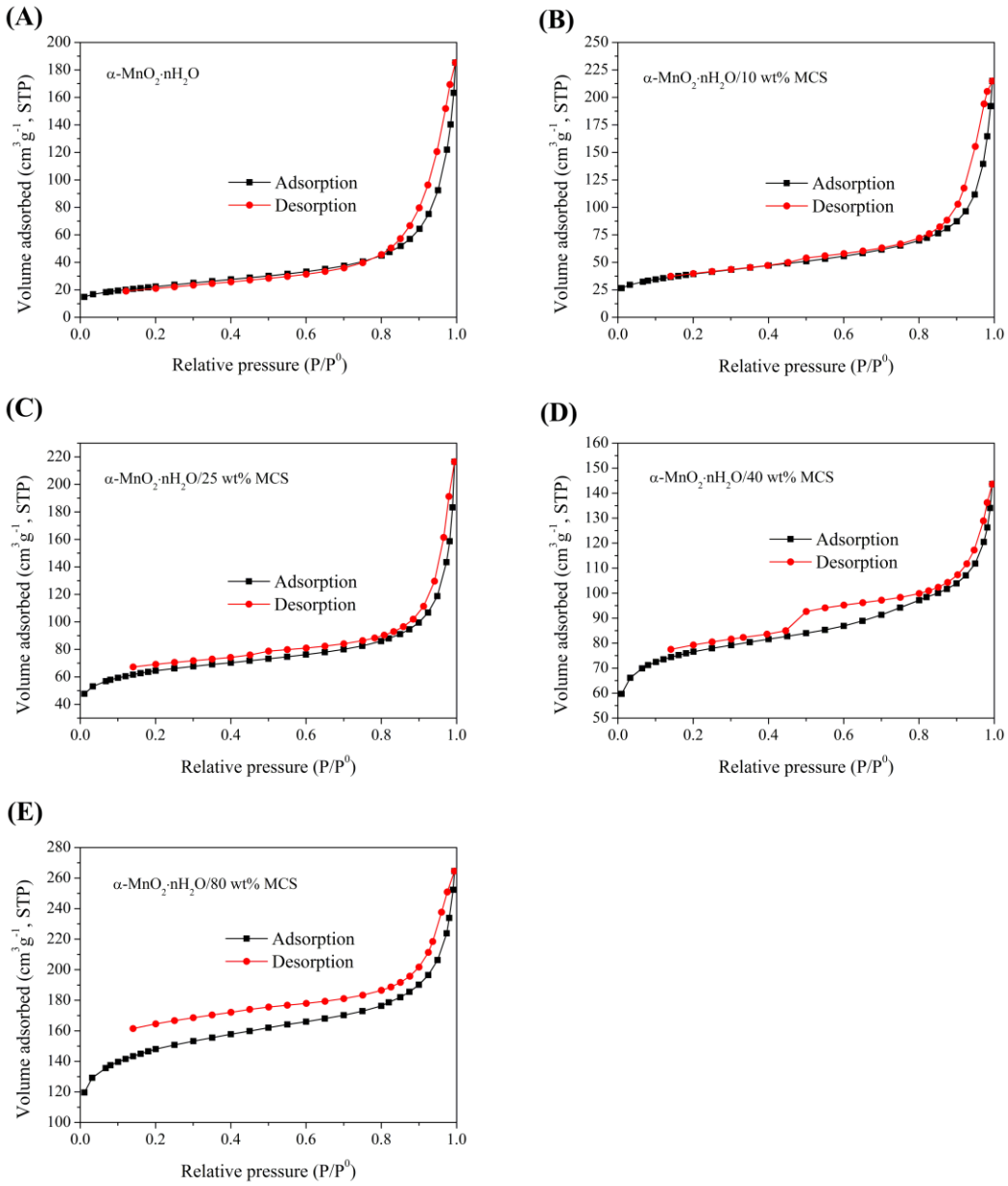


**Fig. S2** Nitrogen adsorption/desorption isotherms of (A) α-$MnO_2$·$nH_2O$, (B) α-$MnO_2$·$nH_2O$/10 wt% MCS, (C) α-$MnO_2$·$nH_2O$/25 wt% MCS, (D) α-$MnO_2$·$nH_2O$/40 wt% MCS, and (E) α-$MnO_2$·$nH_2O$/80 wt% MCS.

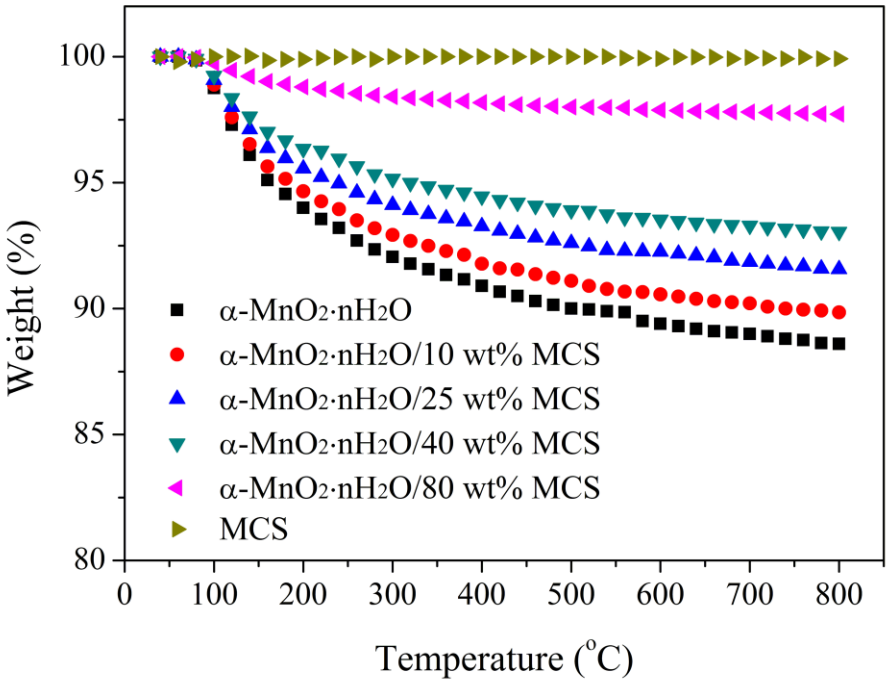


**Fig. S3** TGA results for all the samples.

Fig. S3 shows the TGA results for all the samples. For MCS, because it is the final carbon product of the precursor after heat treated at 1200 ℃ for 5 h in the protection of nitrogen, so the weight of MCS is stable and no weight loss can be observed in the TGA test under nitrogen atmosphere. For α-$MnO_2$·$nH_2O$, the most weight loss occurs between 100 ℃ to 450 ℃, and is about 10 wt %, which is attributed to the loss of the water. Since water evolution is continuous and mostly above 100 ℃, that indicates that it is not adsorbed water, but water in the oxide structure. For the composite, the weight loss is due to the dehydration of the crystal water of α-$MnO_2$·$nH_2O$ component. The sample containing more α-$MnO_2$·$nH_2O$ component exhibits more weight loss. The temperature

Supplementary Material (ESI) for Physical Chemistry Chemical Physics
This journal is (c) The Royal Society of Chemistry 2012

of the initial weight loss for all the composite samples is same. The above result demonstrates that the as-prepared $MnO_2$ is hydrated.

Supplementary Material (ESI) for Physical Chemistry Chemical Physics
This journal is (c) The Royal Society of Chemistry 2012

**Table S1** Summary of the BET surface area for the prepared samples

| | Samples | | | | |
|---|---|---|---|---|---|
| | $\alpha$-$MnO_2 \cdot nH_2O$ | $\alpha$-$MnO_2 \cdot nH_2O$/10 wt% MCS | $\alpha$-$MnO_2 \cdot nH_2O$/25 wt% MCS | $\alpha$-$MnO_2 \cdot nH_2O$/40 wt% MCS | $\alpha$-$MnO_2 \cdot nH_2O$/80 wt% MCS |
| BET surface area ($m^2g^{-1}$) | 79.6 | 135.9 | 223.5 | 261.2 | 505.5 |