Supplementary Information

Unique walnut-shaped porous MnO_2/C nanospheres with enhanced reaction kinetics for lithium storage with high capacity and superior rate capability

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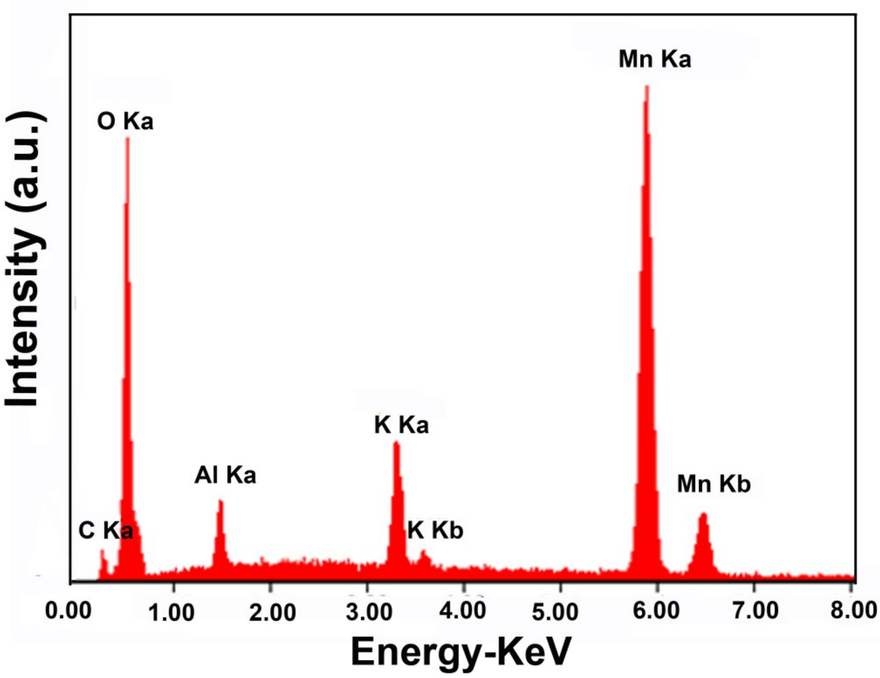

Fig. S1. EDX pattern of MO-NSs.

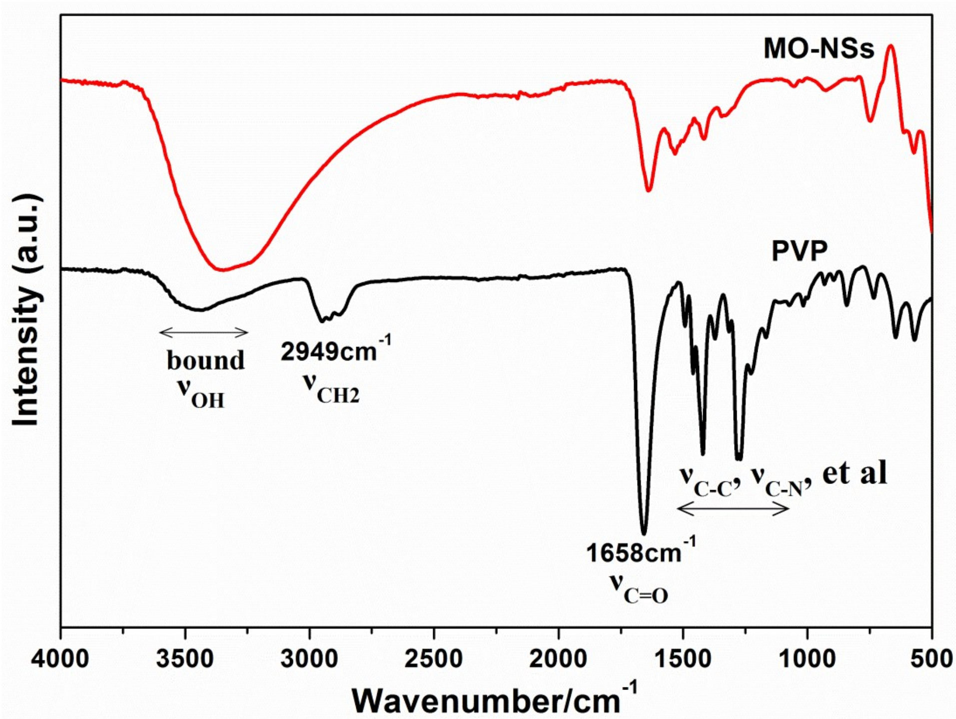

Fig. S2. FT-IR spectra of PVP and MO-NSs.

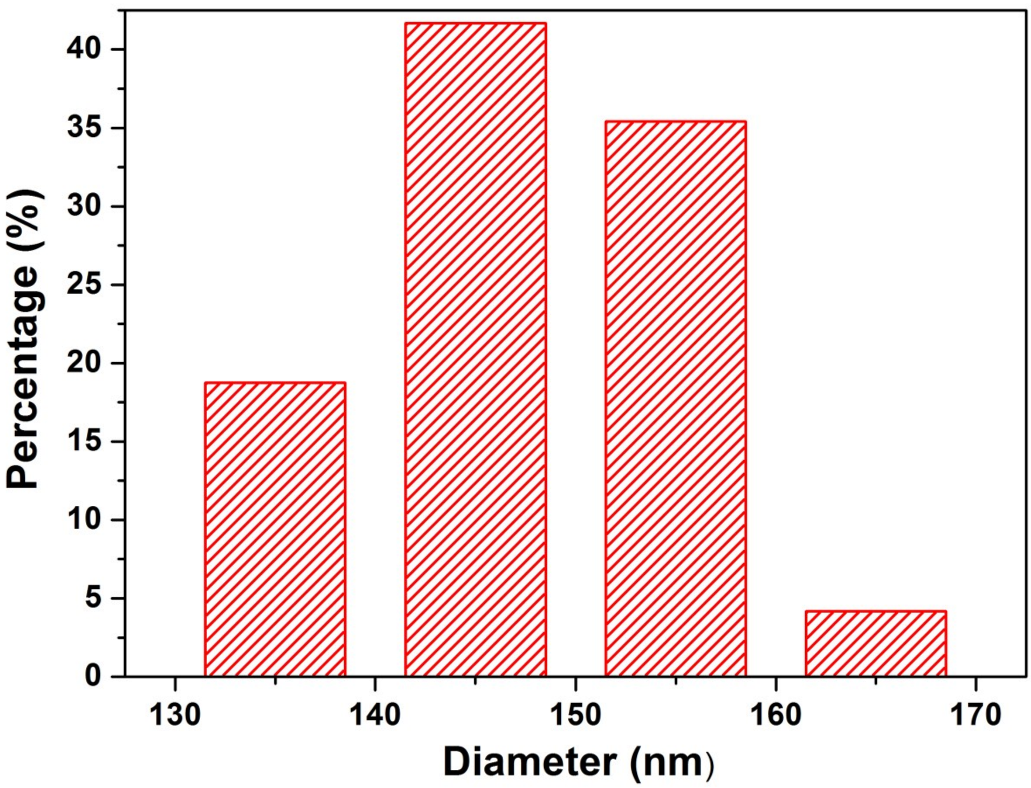

Fig. S3. Size distribution of MO-NSs. Size distribution measured based on the SEM images.

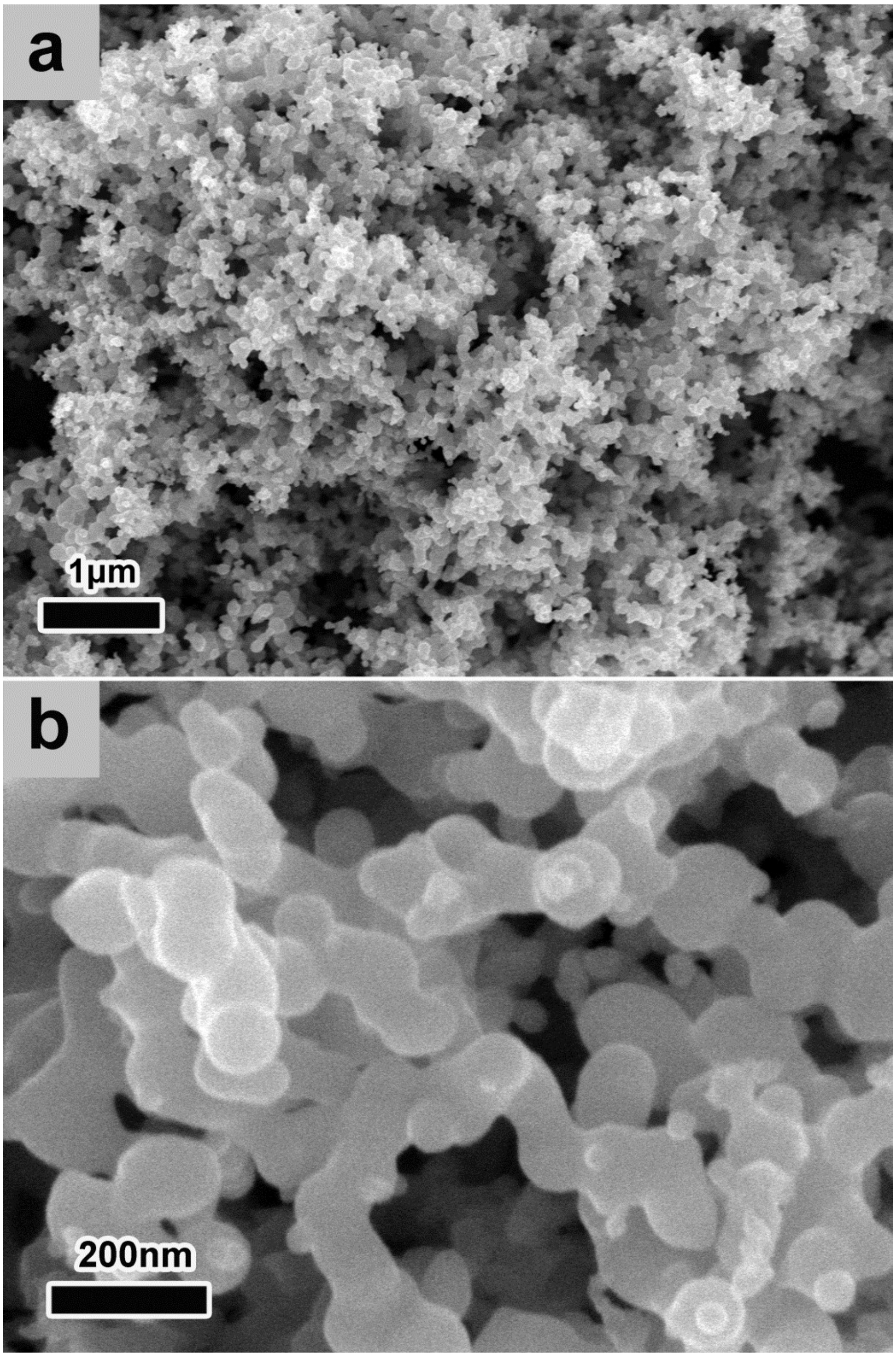

Fig. S4. SEM images of the non-uniform MnO_2 nanoparticles without PVP: (a) low and (b) high magnification.

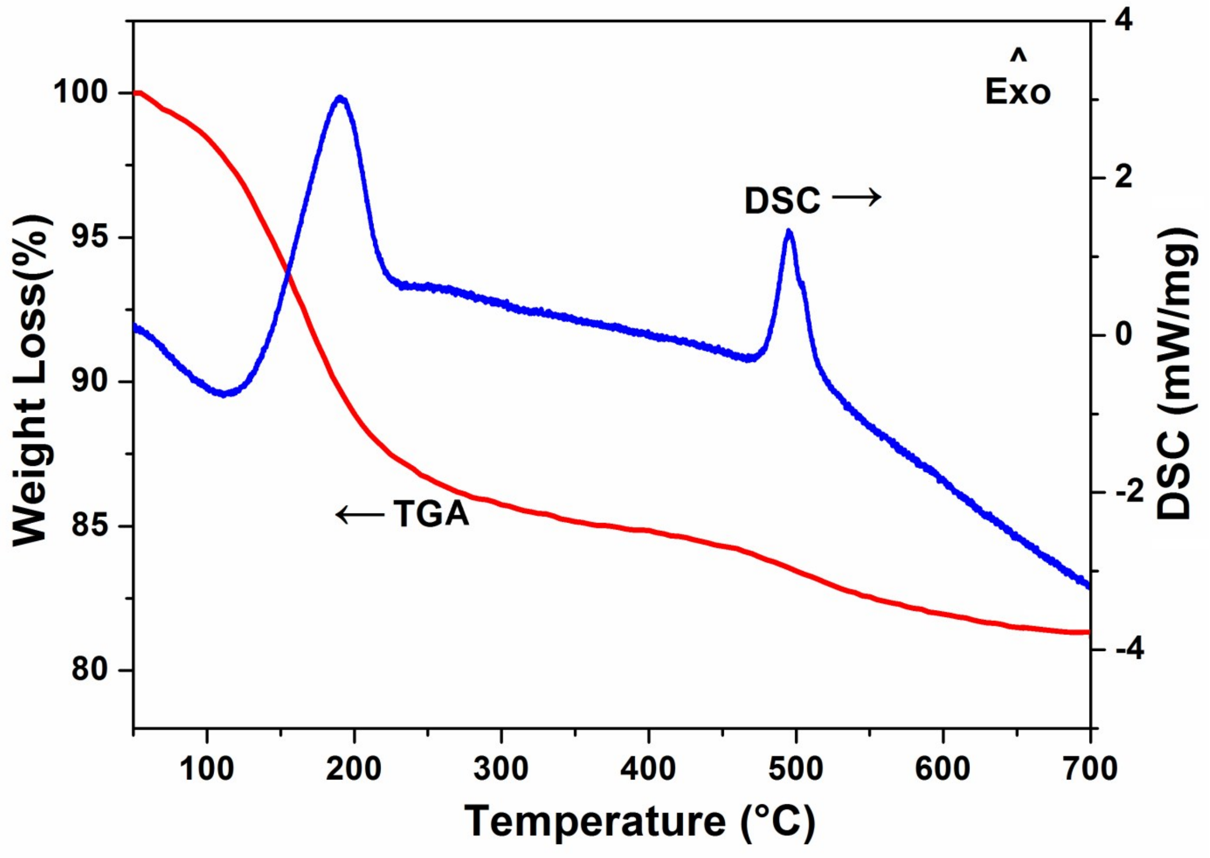

Fig. S5. TGA/DSC plots of MO-NSs under argon at a rate of 5 °C min^{-1} from 50 to 800 °C.

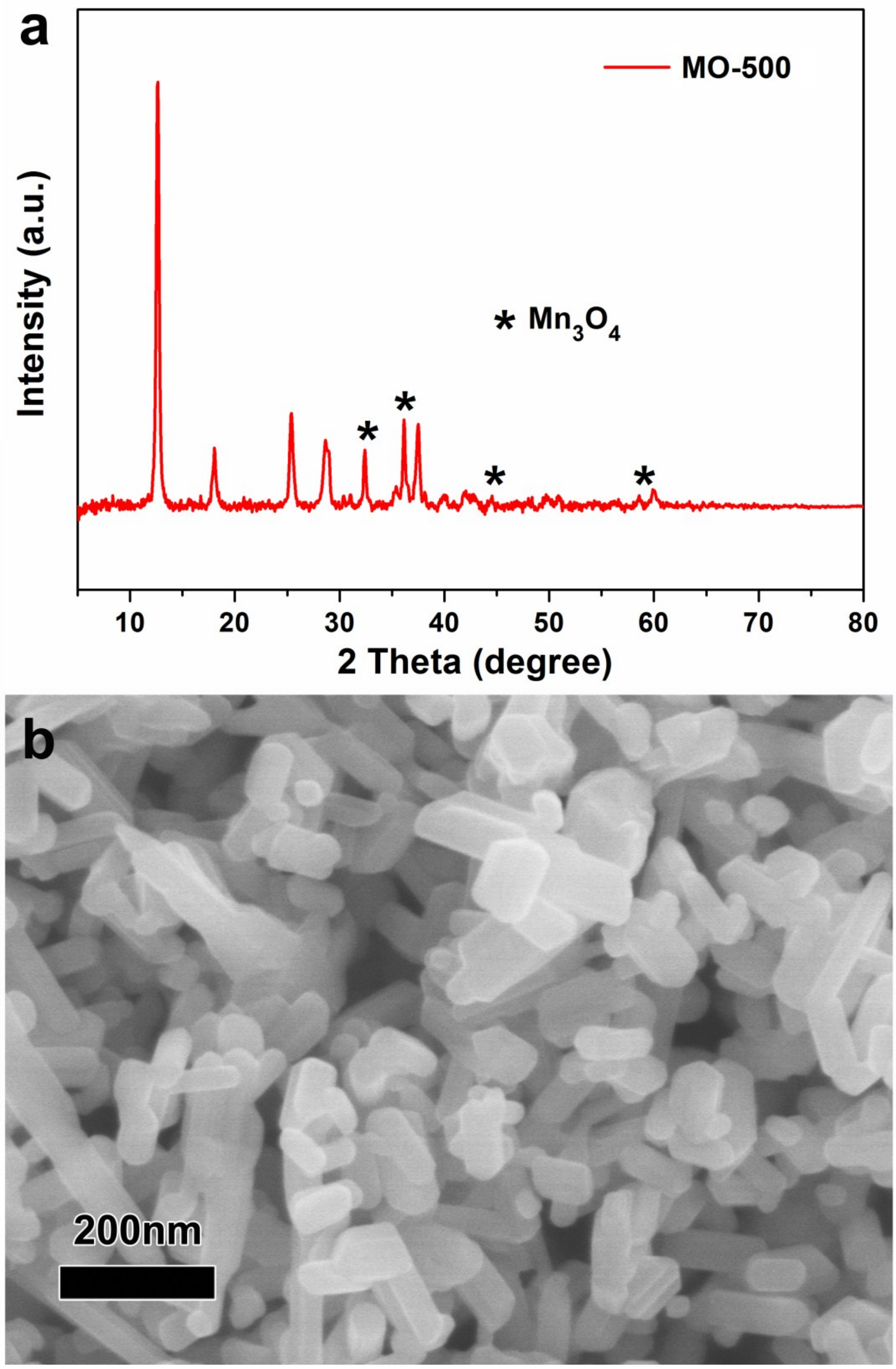

Fig. S6. (a) XRD pattern and (b) SEM image of the sample after annealing under argon at 500 °C, showing the presence of Mn_3O_4.

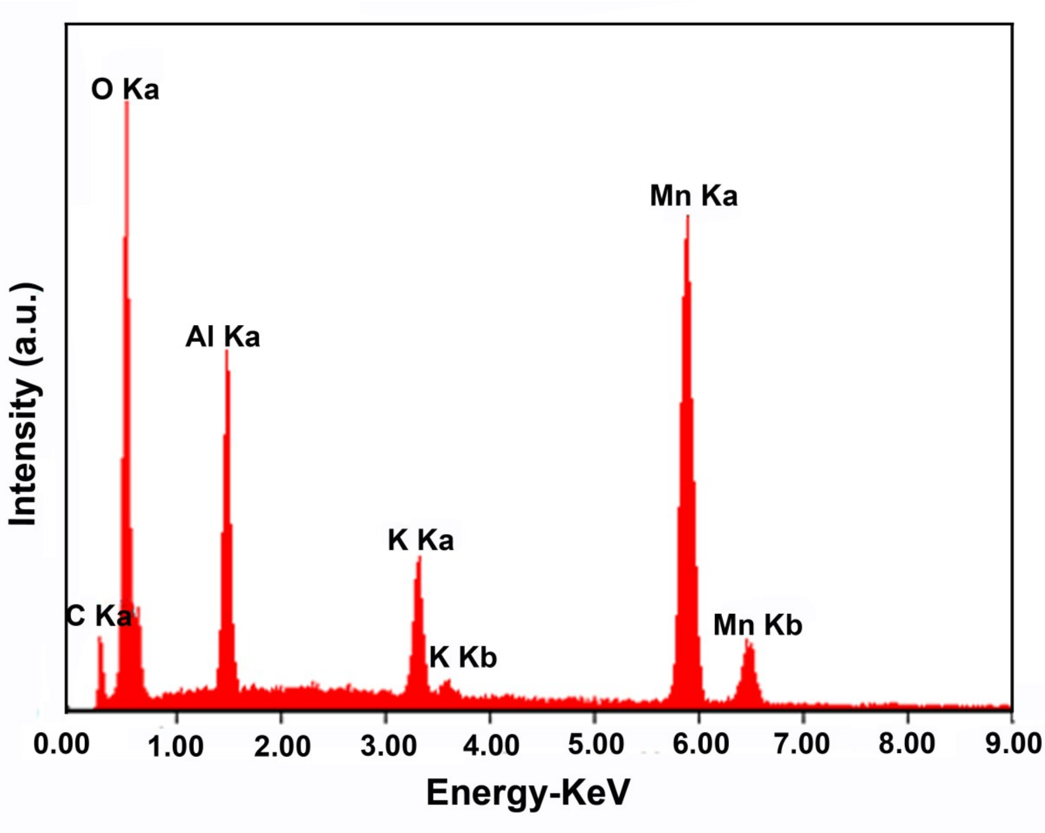

Fig. S7. EDX pattern of MO/C-NSs.

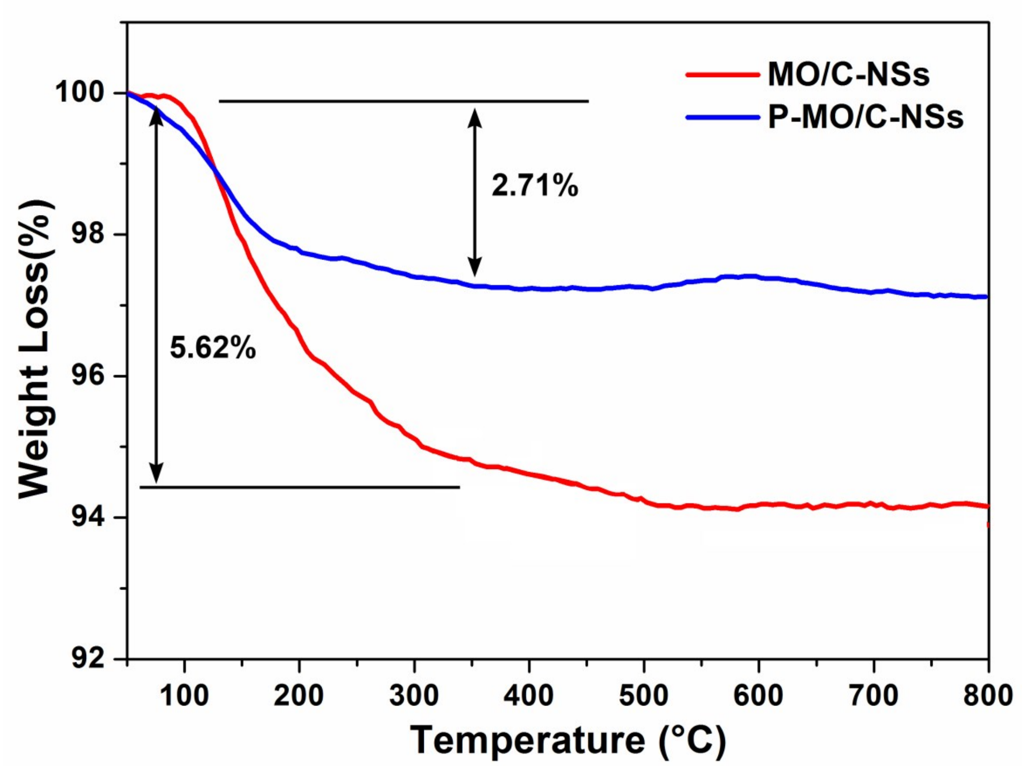

Fig. S8. TGA plots of MO/C-NSs and P-MO/C-NSs under air at a rate of 5 °C min^{-1} from 50 to 800 °C.

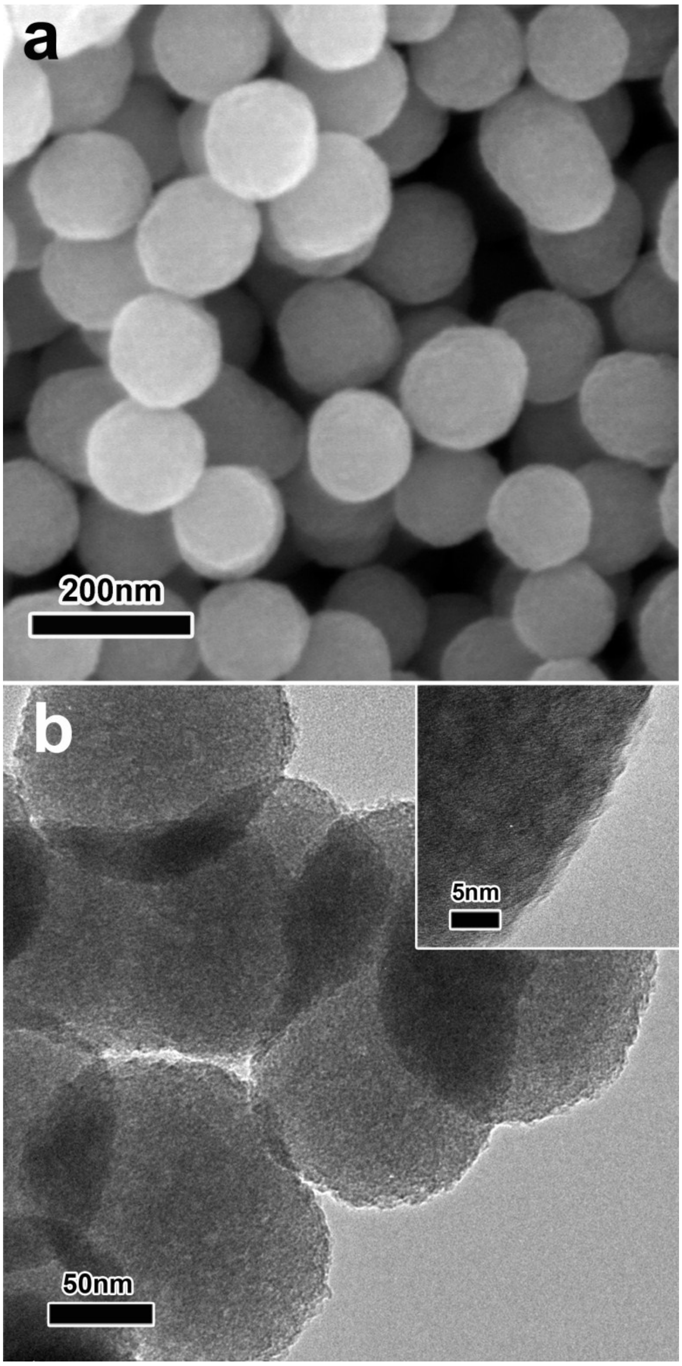

Fig. S9. (a) SEM and (b) TEM images of MO/C-NSs. The inset in (b) is an HRTEM image of the edge of a MO/C-NS sphere.

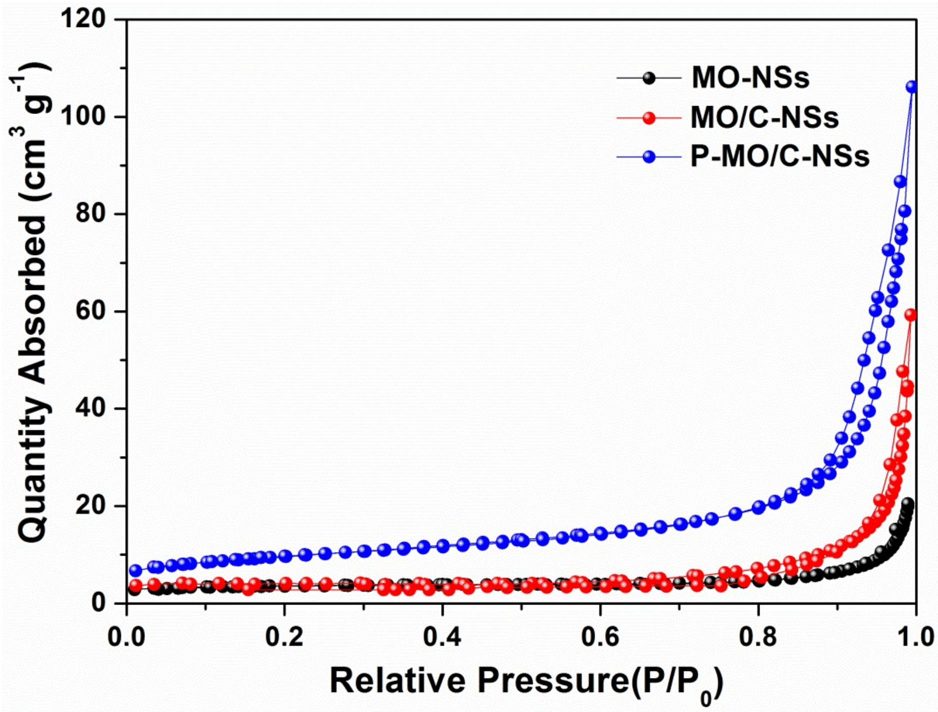

Fig. S10. Nitrogen adsorption-desorption isotherms of MO-NSs, MO/C-NSs and P-MO/C-NSs.

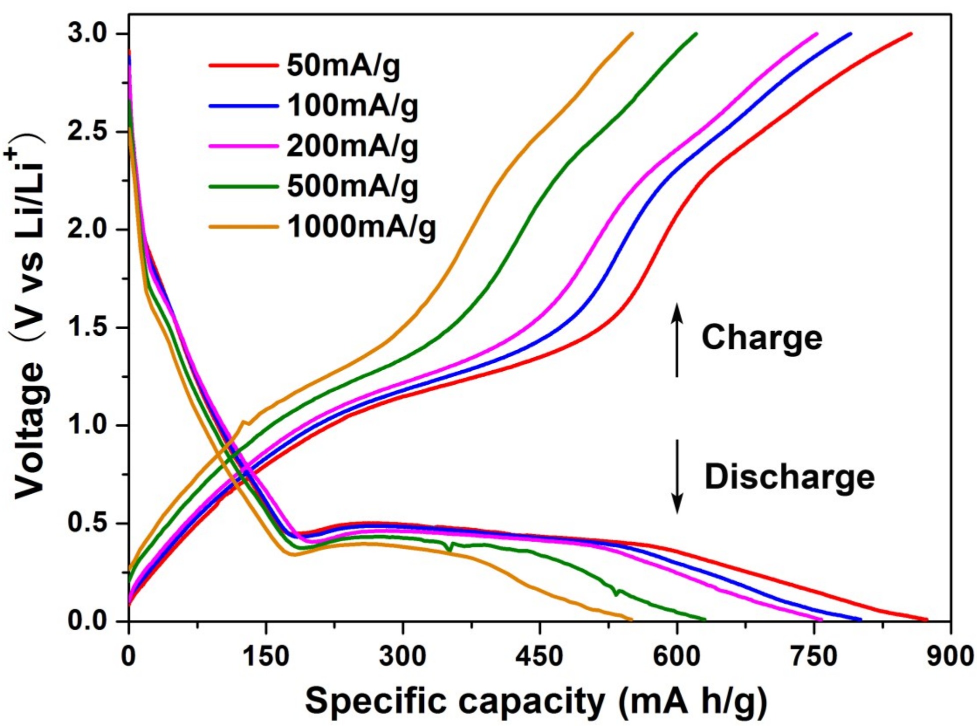

Fig. S11. Discharge/charge profiles of the P-MO/C-NSs electrode at various current densities.

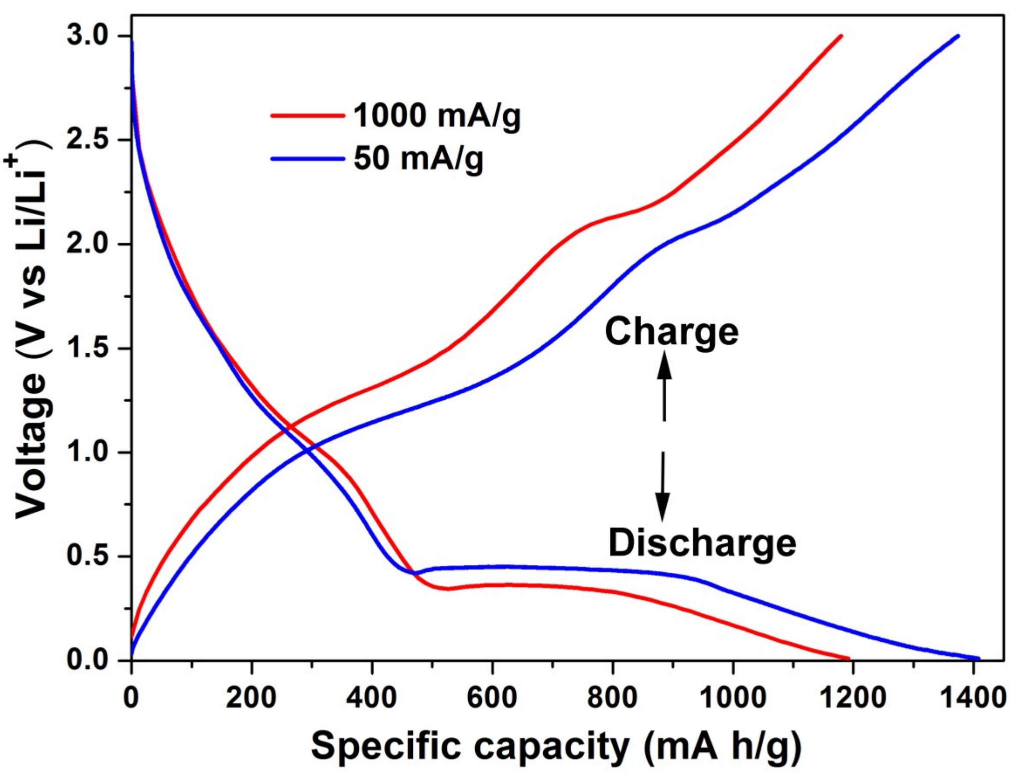

Fig. S12. Discharge/charge profiles of the P-MO/C-NSs electrode at 50 mA g^{-1} and 1000 mA g^{-1} (the 85^{th} cycle), respectively.

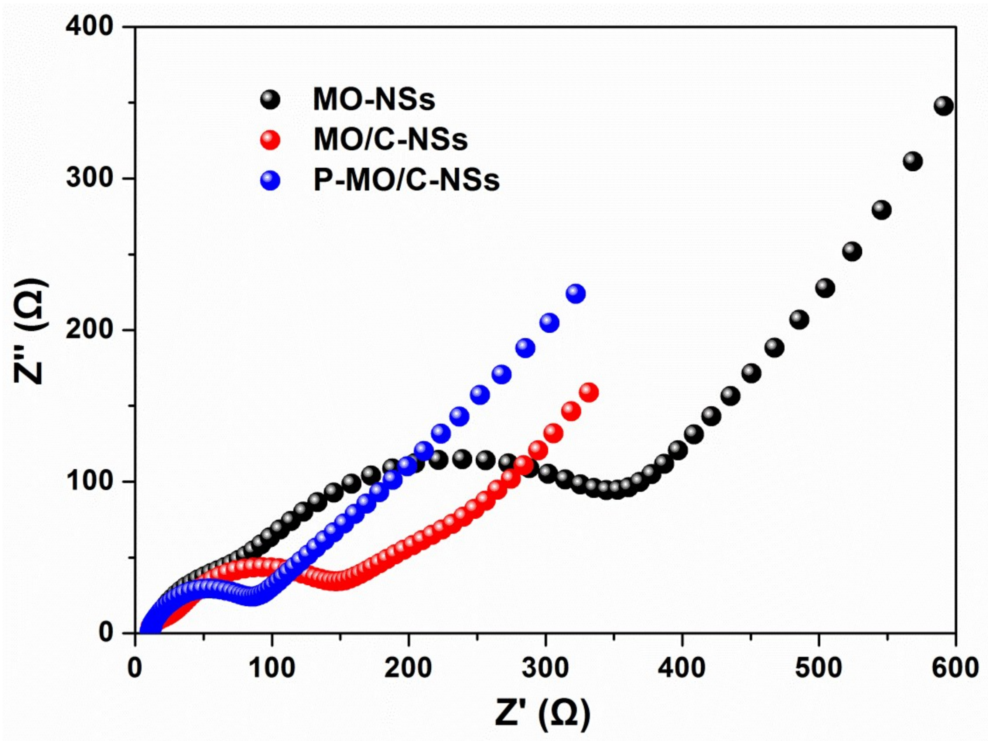

Fig. S13. Electrochemical impedance spectra of the three electrodes after 10 full cycles at 100 mA g^{-1}.

Table S1. The electrochemical performance comparison between our work and other published works

MnO_2 materials	Reversible capacity [mAh/g], cycle numbers	Current density [mA/g]	Initial coulombic efficiency	Ref.
Porous MnO_2/C nanospheres	**1110, 100**	**1000**	**75.2%**	**This work**
MnO_2 hollow urchins	481, 40	270	-	1
MnO_2 nanotubes	656.5, 20	100	50%	2
MnO_2 /carbon nanotube array	500, 15	50	<50%	3
Nanoflaky MnO_2/carbon nanotube	620, 50	200	58.3%	4
PTh-coated MnO_2 nanosheets	500, 100	500	-	5
MnO_2/conjugated polymer/graphene	948, 15	50	59%	6
Graphene-MnO_2 nanotube	495, 40	100	~50%	7
Carbon nanohorns/MnO_2	565, 60	100	70%	8
MnO_2 nanotubes	618, 300	200	-	9
Polymorphic MnO_2	220.7, 30	100	<50%	10
Mesoporous MnO_2 nanosheet arrays	900, 200	1000	-	11
Onion-like carbon/MnO_2	600, 100	200	<50%	12
Porous graphene-like MnO_2	836, 200	100	64%	13
Hollow MnO_2 nanospheres	637, 150	100	<50%	14
MnO_2 nanoflakes/graphene foam	1200, 300	500	~65%	15
Nitrogen-doped graphene/MnO_2	750, 200	300	50%	16

Reference:

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