Supporting Information

Mesoporous single-crystalline V_2O_5 nanorods assembled into hollow microspheres as cathode materials for high-rate and long-life lithium-ion batteries

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Characterization:

Structural information on the as-prepared products were characterized with X-ray powder diffractometer (XRD; Rigaku D/Max 2550, Cu Kα radiation) at a scan rate of 1° min^{-1}, field emission scanning electron microscopy (FESEM; Hitachi, S-4800), and transmission electron microscopy (TEM; JEOL, JEM-2100F) operated at 200kV. N_2 adsorption/desorption was determined by Brunauer-Emmet-Teller (BET) measurements using an ASAP-2020 surface area analyser. Raman measurement was performed with a Renishaw 2000 system with a 514.5 nm Ar-ion laser and charge-coupled device detector.

Electrochemical measurements:

Electrochemical measurements were performed using coin-type 2016 cells. The working electrode were prepared by mixing the as-synthesized active materials, carbon black, and poly(vinyl difluoride) (PVDF) at a weight ratio of 70 : 20 : 10, and then pasted on pure Al foil. 1) The coating thickness on Al foil is about 50 μm and the electrode area is about 1.12 cm2. The mass loading of the active materials is about 0.4 mg. Pure lithium foil was used as counter electrode, and the separator was a polypropylene membrane (Celgard 2400). The electrolyte consists of a solution of 1 M $LiPF_6$ in ethylene carbonate (EC)/dimethyl carbonate (DMC) (1:1 in volume). The cells were assembled in an argon-filled glove box. Cyclic voltammogram experiment was performed on an Autolab PGSTAT302N electrochemical workstation at scan rates of 0.2 mV s^{-1}. The charge and

discharge measurements were carried out on a LAND-CT2001C test system at different current densities.

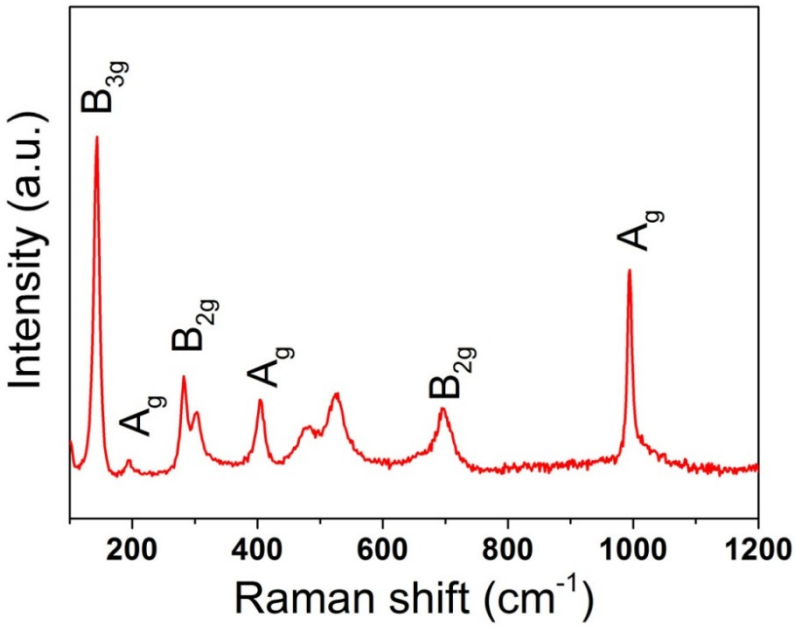

Fig. S1 Raman spectrum of the novel V_2O_5 hollow microspheres.

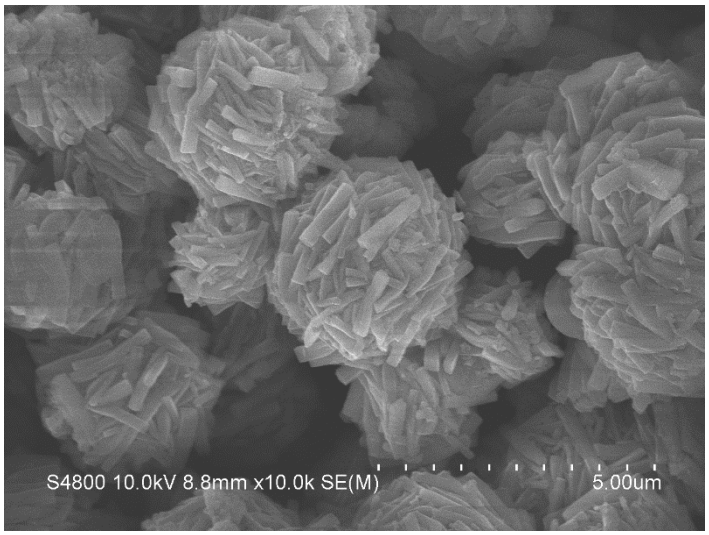

Fig. S2 SEM image of the V_2O_5 precursor obtained after hydrothermal treatment at 200 ^oC.

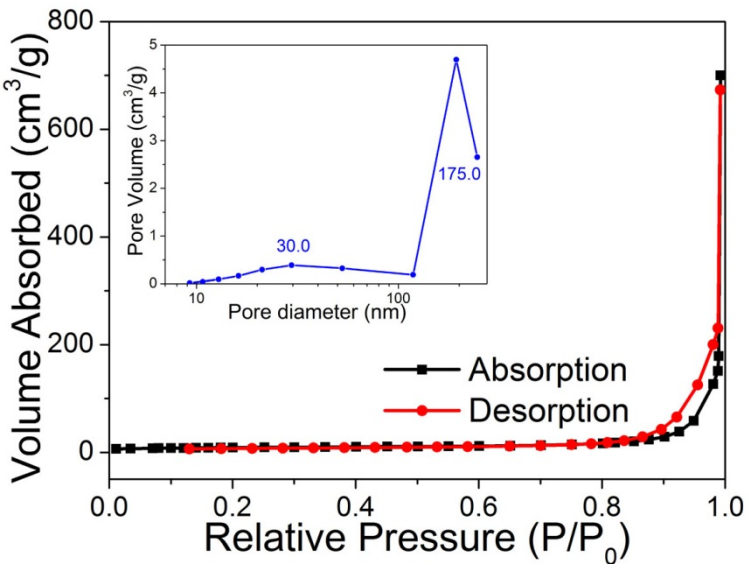

Fig. S3 N_2 adsorption/desorption isotherm and the corresponding BJH pore-size distribution curve (inset) of the novel V_2O_5 hollow microspheres.

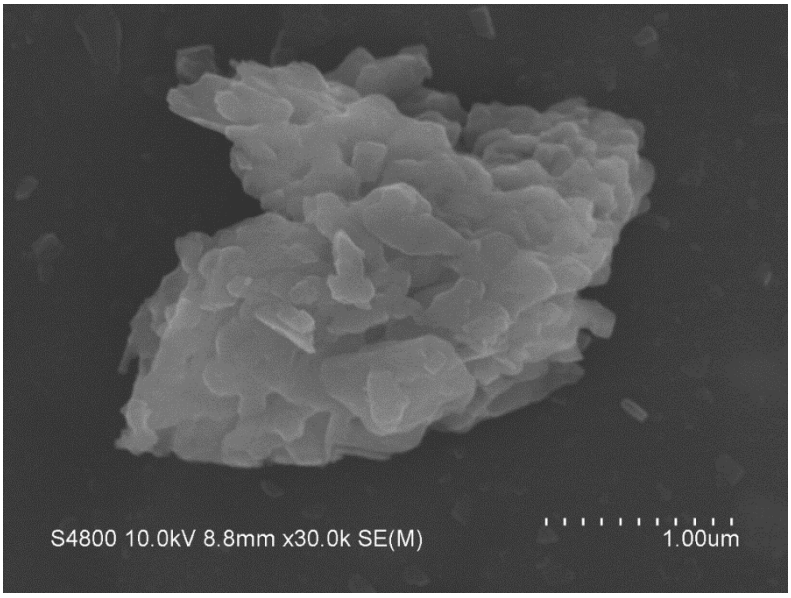

Fig. S4 SEM image of the V_2O_5 nanoparticles aggregations.

Table S1. Comparison of electrochemical performance of different V_2O_5 electrode materials.

Electrode material	Specific capacity ($mAh\ g^{-1}$)	Capacity after cycling ($mAh\ g^{-1}$)	Reference
V_2O_5 hollow microflowers	4-2.5 V: ~140 at 300 mA g^{-1}	120 after 100 cycles	Ref [1]
Porous V_2O_5 microspheres	4-2.5 V: ~140 at 75 mA g^{-1}	130 after 100 cycles	Ref [2]
Walnut-like vanadium oxide film	4-2.5 V:~123 at 147 mA g^{-1}	110 after 100 cycles	Ref [3]
V_2O_5 nanofibers	4-2.5 V: ~140 at 200 mA g^{-1}	127 after 30 cycles	Ref [4]
Hierarchical V_2O_5 hollow microspheres	4-2.5 V:~137 at 300 mA g^{-1}	128 after 50 cycles	Ref [5]
Hollow microspheres assembled with MSC-V_2O_5 nanorods	4-2.5 V: ~143 at 300 mA g^{-1}	129 after 200 cycles	this work

1 A. Q. Pan, H. B. Wu, L. Zhang and X. W. Lou, *Energy Environ. Sci*., 2013, 6, 1476-1479.

2 C. Zhang, Z. Chen, Z. Guo and X. W. Lou, *Energy Environ. Sci*., 2013, 6, 974-978.

3 Y. Sun, L. Zhang, S. Wang, I. Lieberwirth, Y. Yu and C. Chen, *J. Power Sources*, 2013, 228, 7-13.

4 Y. L. Cheah, V. Aravindan and S. Madhavi, *ACS Appl. Mater. Interfaces*, 2013, 5, 3475-3480

5 A. Pan, T. Zhu, H. B. Wu and X. W. Lou, *Chem. Eur. J*, 2013, 19, 494-500.