Electronic Supplementary Material (ESI) for New Journal of Chemistry

Supplementary Information for

Ultralong $H_2V_3O_8$ Nanowire Bundles as a Promising Cathode for Lithium Batteries†

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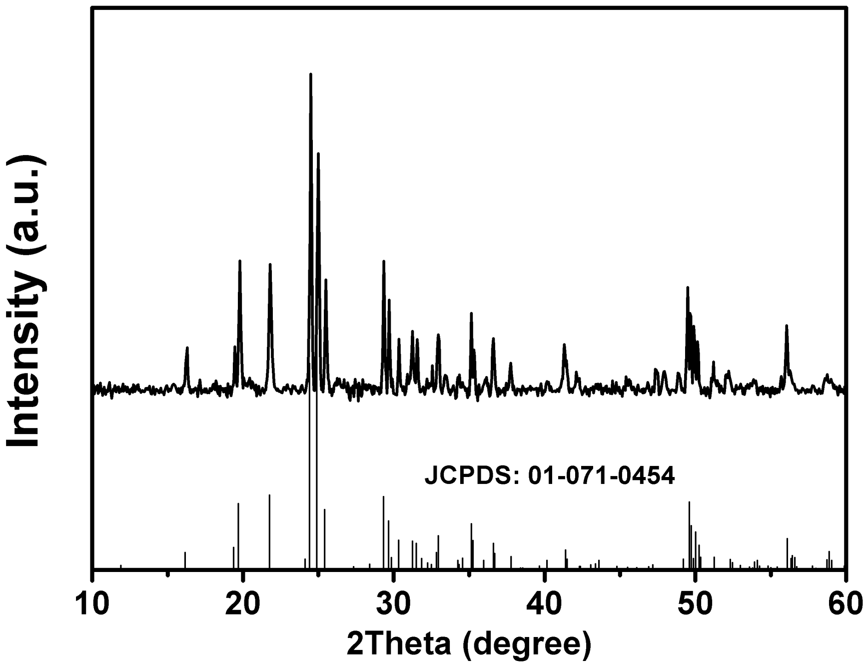

Figure S1. XRD pattern of V_3O_7 nanowires

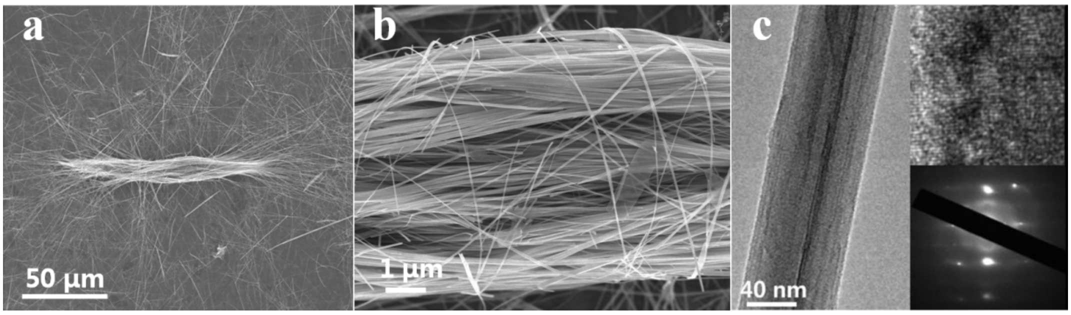

Figure S2. (a, b) SEM images of the bunched V_3O_7 nanowires. (c) TEM images and SAED pattern (inset) of V_3O_7 nanowires.

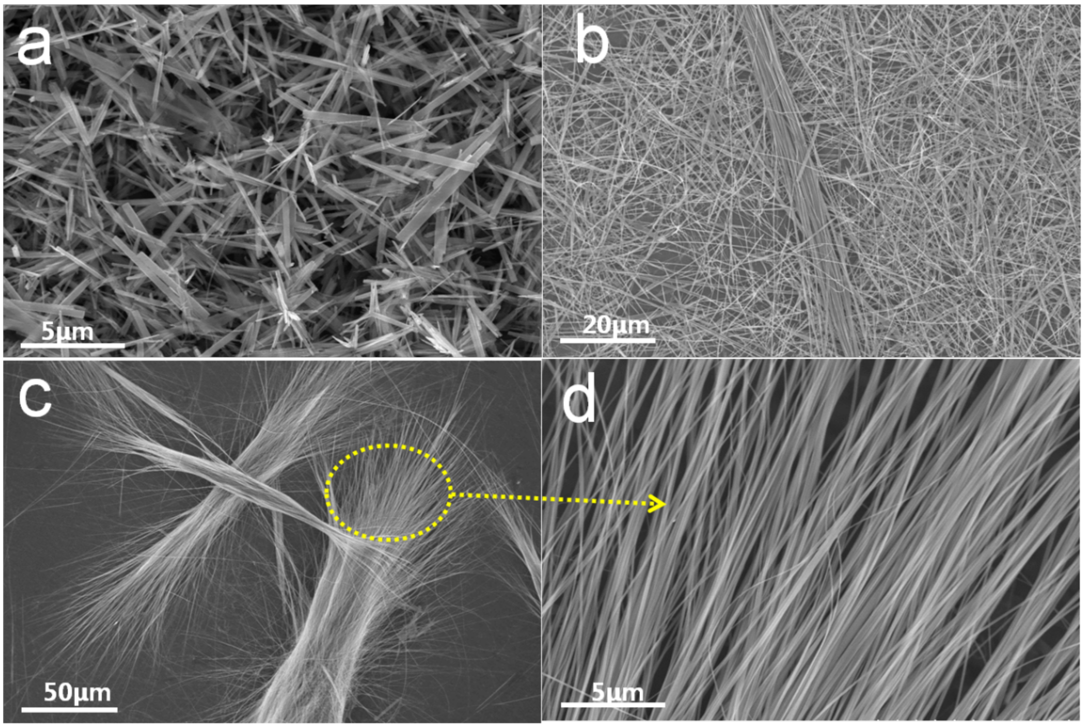

Figure S3. SEM images of vanadium oxides nanowires with different ratio of V_2O_5 sol to PEG: (a) 4:0, (b) 4:1 and (c, d) 4:2.

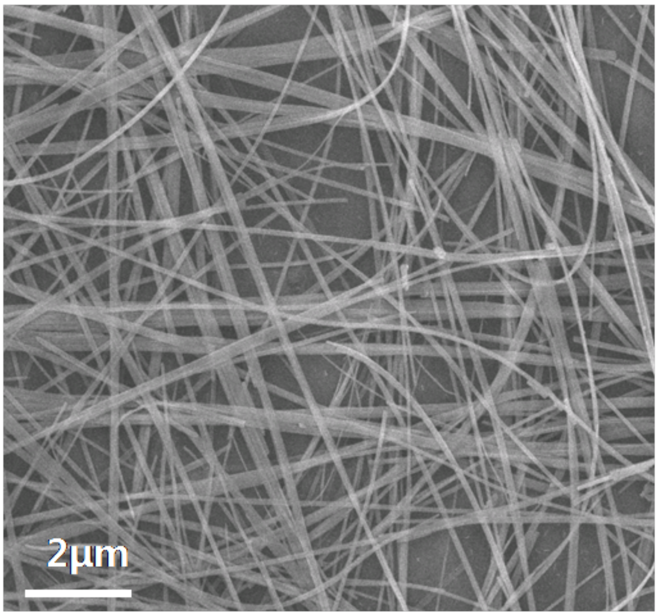

Figure S4. SEM of vanadium oxide nanowires when replace V_2O_5 sol with V_2O_5 powder (V_2O_5 to PEG is 4:2).

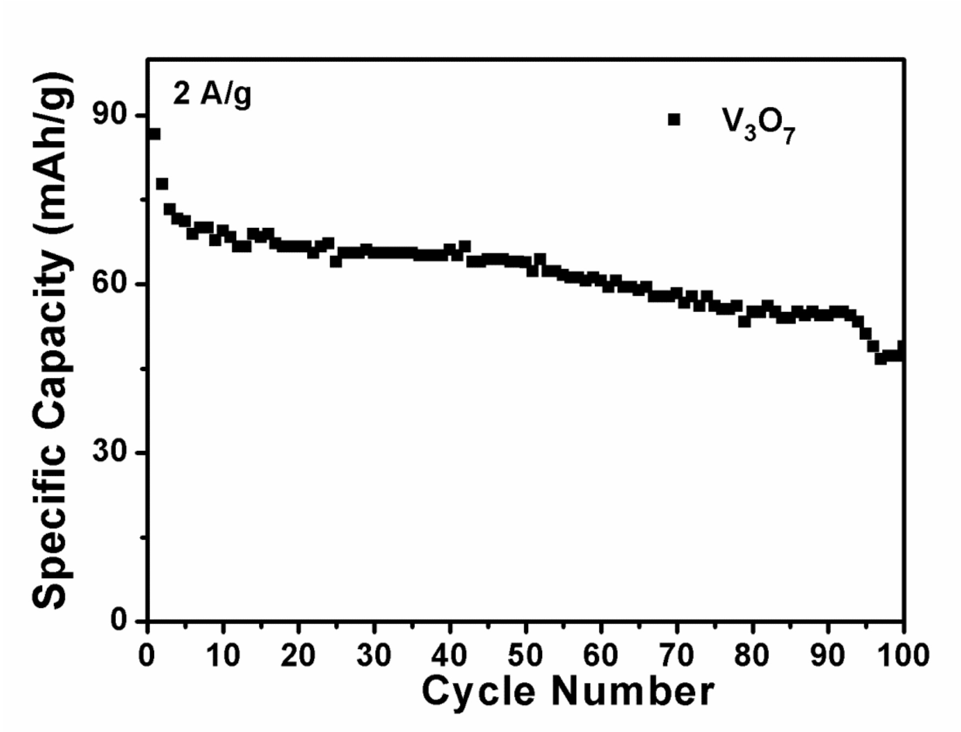

Figure S5. The cycle stability of V_3O_7 at the current density of 2000 mA/g.

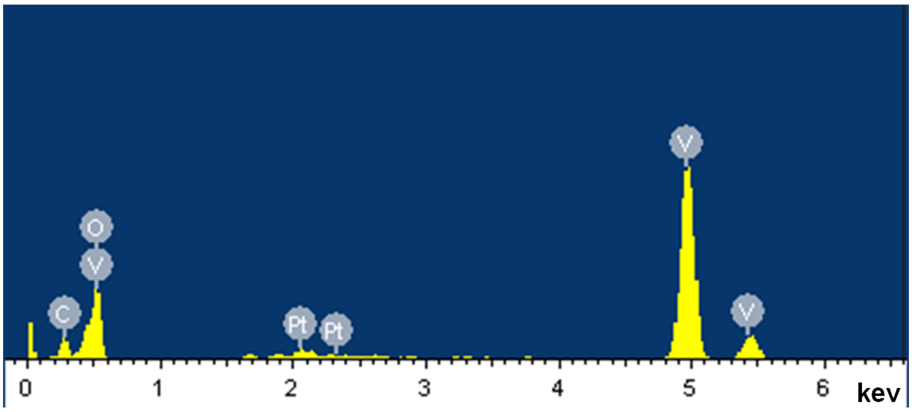

Figure S6. EDS spectra of the $H_2V_3O_8$ nanowires.

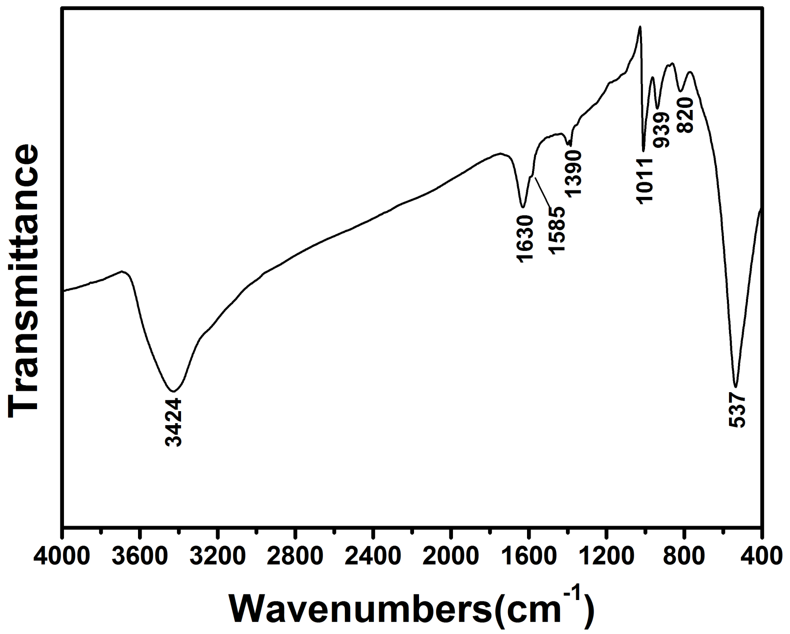

Figure S7. FT-IR spectra of the $H_2V_3O_8$ nanowires.

The signals at 537 cm^{-1} and 820 cm^{-1} can be attributed to the symmetric and asymmetric V–O–V stretching vibrations[1,6], respectively. The absorptions at 939 cm^{-1} and 1011 cm^{-1} are due to V=O stretching vibrations of trigonal bipyramids and distorted octahedras[2,5], respectively. The peaks at 3424 cm^{-1} and 1630 cm^{-1} are attributed to O–H stretching vibration and H–O–H bending vibration[3], respectively. In addition, signals at 1585 cm^{-1} and 1390 cm^{-1} can be attributed to the symmetric and asymmetric –COOH stretching vibrations[4], respectively. With H–O–H bending vibration at 1630 cm^{-1} effecting, the peak derived from the symmetric –COOH stretching vibration is not obvious.

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Table S1. The electrochemical performances comparesion (cycling performance at relevant current rate or density, and rate capability) of the $H_2V_3O_8$ NWs with the reported ones.

Sample	Voltage range	Capacity (mAh g^{-1}) / Cycle number	Current rate or density	Rate capacity (mA h g^{-1}) at relevant Current rate or density
$H_2V_3O_8$ NWs in this work	1.5 – 3.75 V	~225 / 50	0.1 A/g	~150 at 1 A/g (100 cycles)
$H_2V_3O_8$ NWs[1]	-0.9 – 0.5 V vs. SCE	~150 / 50	0.2 A/g	~170 at 1 A/g (only 1 cycle)
$V_3O_7 \cdot H_2O$ nanobelts[2]	1.5 – 3.75 V	~250 / 20	0.02 A/g	~160 at 1 A/g (20 cycles)
$V_3O_7 \cdot H_2O$ nanobelts[3]	1.7 – 3.8 V	228.6 / 50	0.03 A/g	Not given

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