Supporting Information for

A High Capacity Ammonium Vanadate Cathode for Zinc-ion Battery

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Supplementary Figures and Table

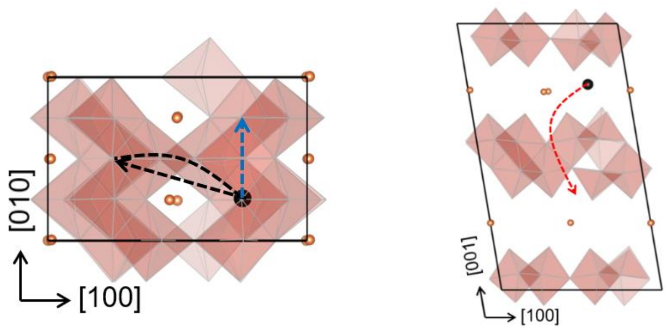

Fig. S1 Schematics of possible diffusion pathways for Zinc ion diffusion in monoclinic $NH_4V_4O_{10}$ viewed along the [100] (black arrows), [010] (blue arrow) and [001] (red arrow) direction. Orange and black balls indicate NH_4^+ ions and the most energetically favorable location for Zn^{2+} intercalation, respectively. The VO layers are represented by red polyhedrons.

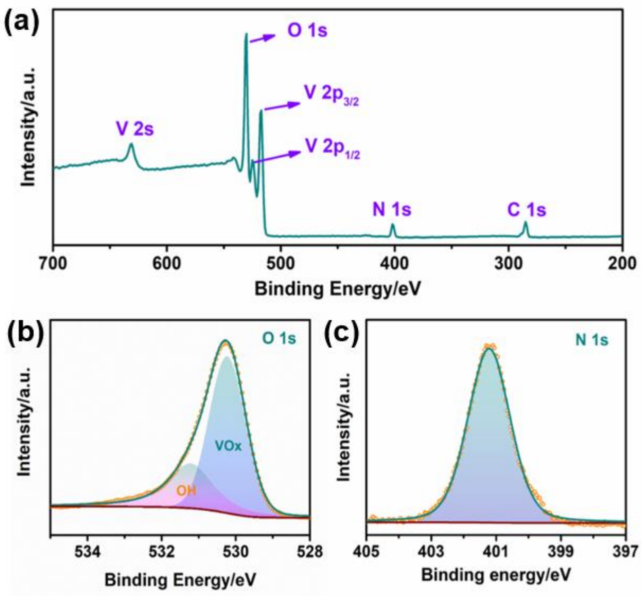

Fig. S2 The full XPS spectrum **(a)**, and high-resolution XPS spectra of O **(b)** and N **(c)** species.

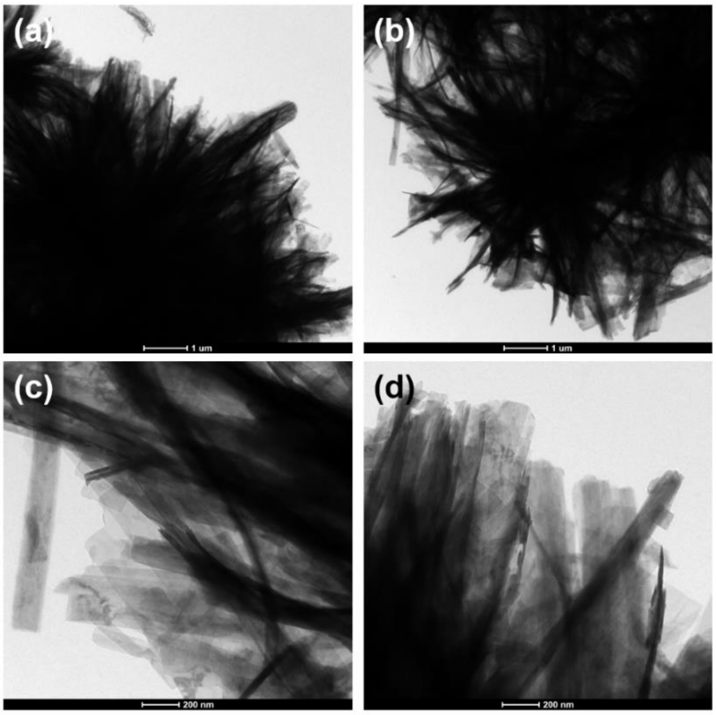

Fig. S3 TEM images of the 3D-NVO sample at different magnifications

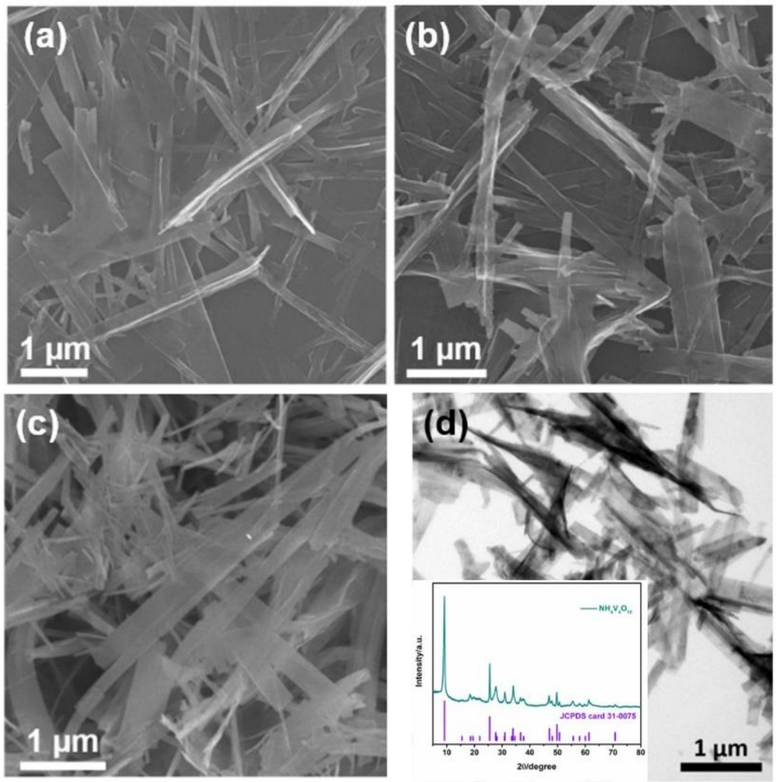

Fig. S4 (a-c) SEM and **(d)** TEM images of the sample prepared by conventional autoclave hydrothermal method at reaction time of 2 h **(a)**, 6 h **(b)** and 12 h **(c and d)**. Inset in (d) is the corresponding XRD pattern obtained at 12 h, which can be assigned to a pure monoclinic structure of $NH_4V_4O_{10}$ (JCPDS Card No. 31-0075).

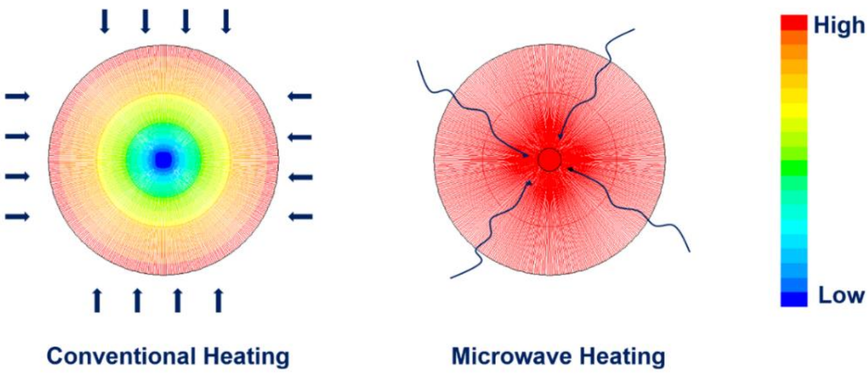

Fig. S5 Schematic illustration of the difference between microwave and conventional heating. In conventional heating system, there is a temperature gradient from the outside to the inner core.

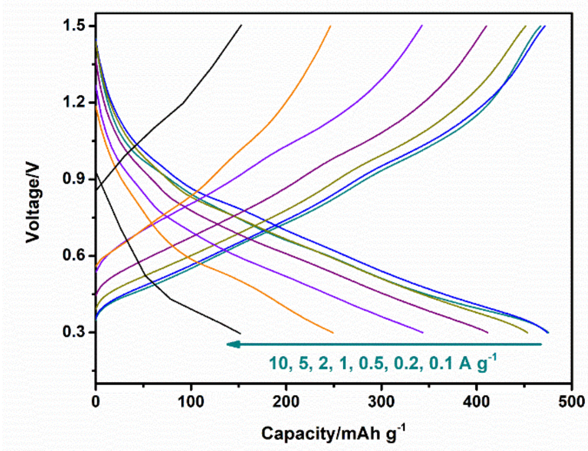

Fig. S6 Galvanostatic discharge and charge profiles of the 3D-NVO cathode at different current densities

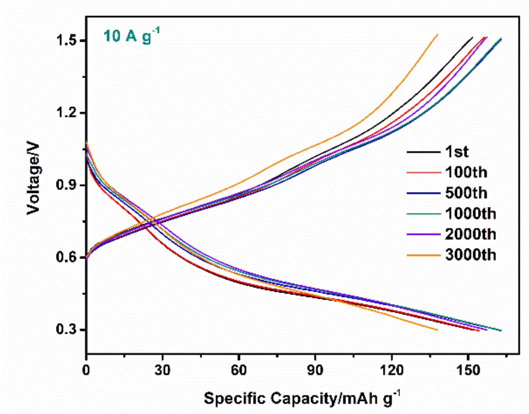

Fig. S7 Galvanostatic discharge and charge profiles of the 3D-NVO cathode during different cycles at 10 A g^{-1}

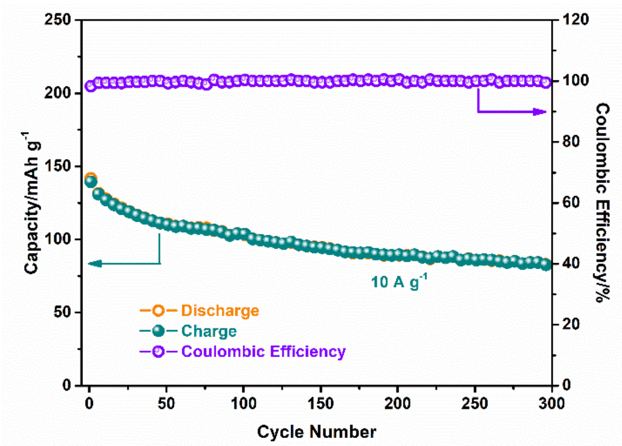

Fig. S8 Cycling performance of the NVO nanobelts obtained from the traditional hydrothermal method at 10 A g^{-1}

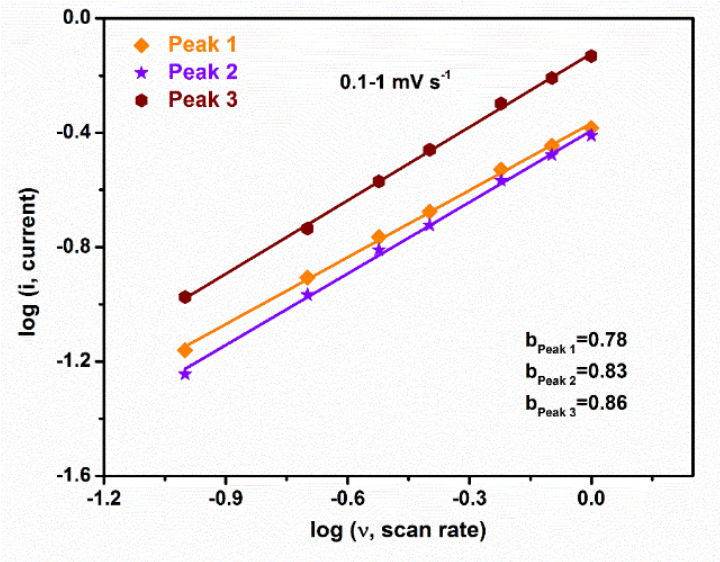

Fig. S9 Plots of log(i) vs. log(ν) based on anodic and cathodic peaks in Fig. 3f

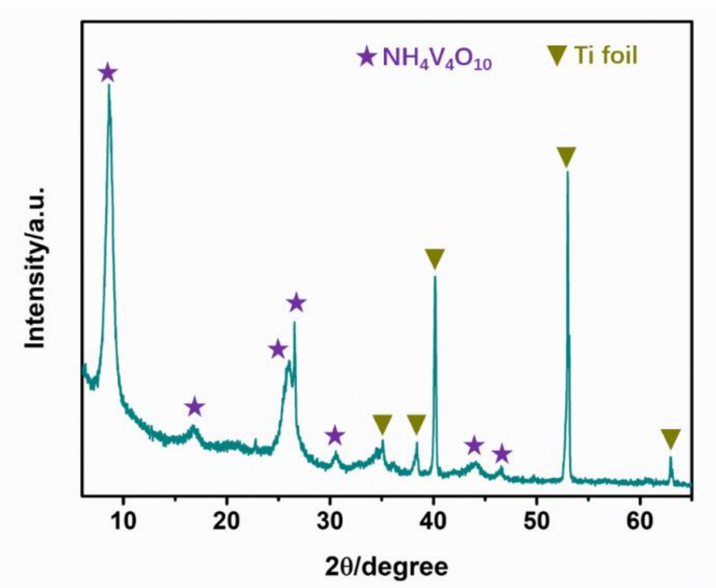

Fig. S10 The XRD pattern of the 3D-NVO cathode after 100 cycles at 10 A g^{-1}

Table S1 A comparison of the reversible capacity of our 3D-$NH_4V_4O_{10}$ cathode to previously reported superior ZIB cathodes

Cathode materials	Reversible capacity [mAh g^{-1}]	Rate [mA g^{-1}]	Number of cycles	Capacity retention
This work (3D-$NH_4V_4O_{10}$)	**486**	**100**	**50**	**98%**
α-MnO_2 [S1]	233	83	50	63%
δ-MnO_2 [S2]	225	83	100	50%
Mn_3O_4 [S3]	195	200	70	67%
$ZnMn_2O_4$ [S4]	106	100	300	59%
VO_2 [S5]	357	100	50	99%
VS_2 [S6]	138	200	200	80%
V_2O_5 [S7]	215	100	160	95%
$V_2O_5·nH_2O$ [S8]	196	14.4	120	87%
$H_2V_3O_8$@Graphene [S9]	360	300	150	93%
LiV_3O_8 [S10]	185	133	65	78%
$Na_{0.33}V_2O_5$ [S11]	276	200	100	91%
$Zn_2V_2O_7$ [S12]	210	300	200	94%
$Zn_3V_2O_7(OH)_2·2H_2O$ [S13]	149	200	300	68%
$Na_2V_6O_{16}·1.63H_2O$ [S14]	296	100	100	78%
$Na_{1.1}V_3O_{7.9}$@rGO [S15]	200	50	30	87%
$V_{1-x}Al_xO_{1.52}(OH)_{0.77}$ [S16]	156	15	50	68%
$Na_3V_2(PO_4)_3$@C [S17]	97	50	100	74%

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