Supporting information

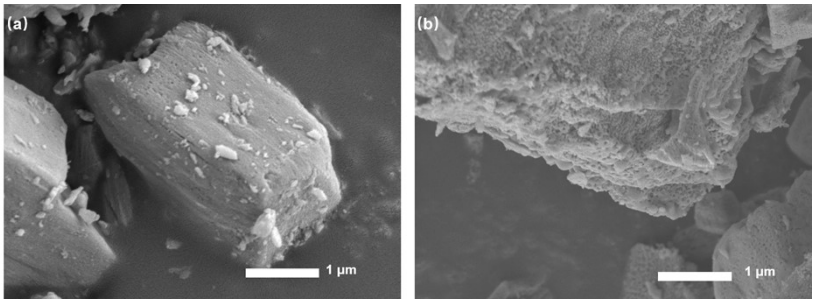

Fig. S1 (a) Intermediate products of Mn-BDC and NH_4VO_3 annealed at 200℃. (b) SEM image of MVO@C .

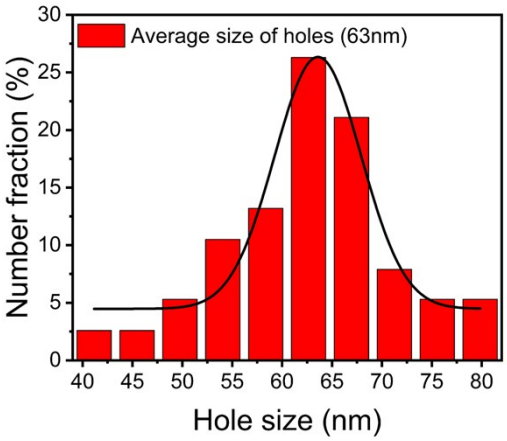

Fig. S2 Pore size distribution on MVO@C layered nanoplates.

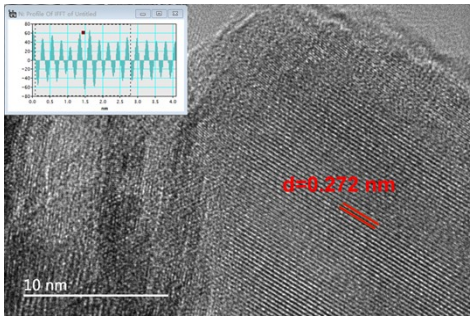

Fig. S3 The HRTEM image of MVO@C.

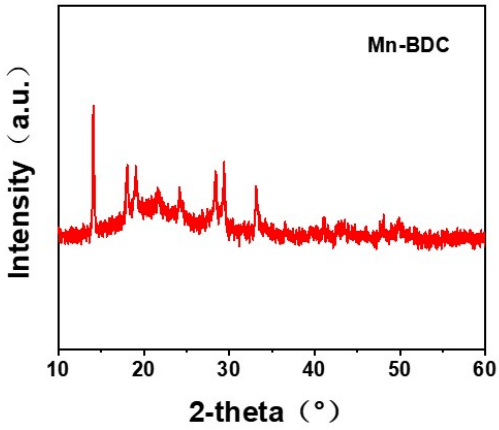

Fig. S4 The XRD pattern of Mn-BDC.

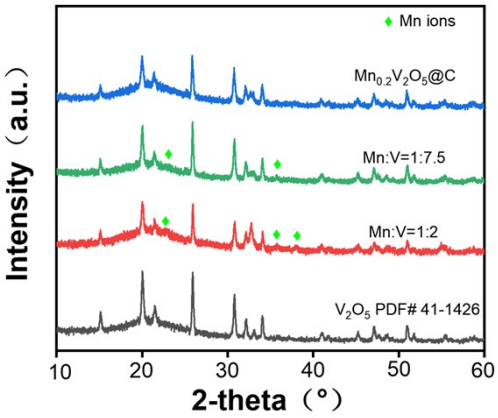

Fig. S5 XRD patterns of MVO@C cathode at different V and Mn ratios.

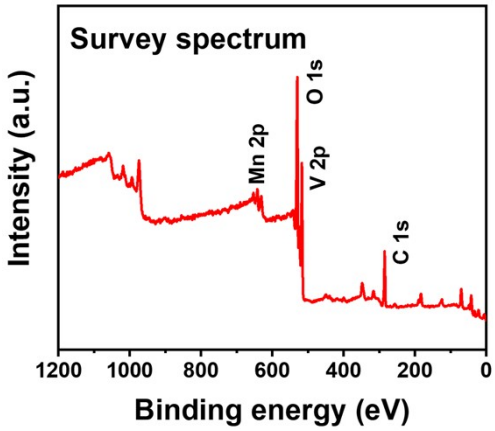

Fig. S6 Total XPS spectrum of MVO@C.

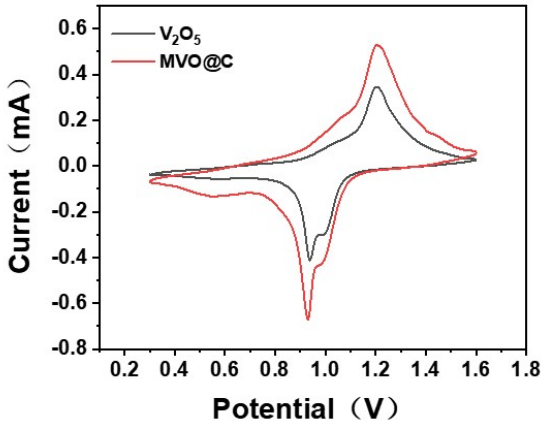

Fig. S7 CV comparison of MVO@C and V_2O_5 at 0.1mV s^{-1} scan rate.

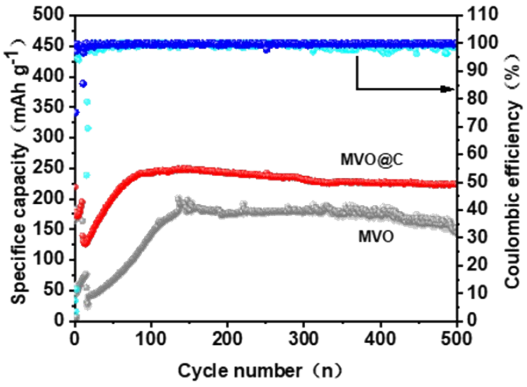

Fig. S8 Cycle performance of MVO@C and MVO at 4 A g^{-1}.

Table S1. Rs (Ω) and Rct (Ω) values on electrochemical impedance spectroscopy of MVO@C.

Cycle number	MVO@C Rs (Ω)	MVO@C Rct (Ω)
0	4.962	432.6
50	2.651	59.62
250	1.24	13.9

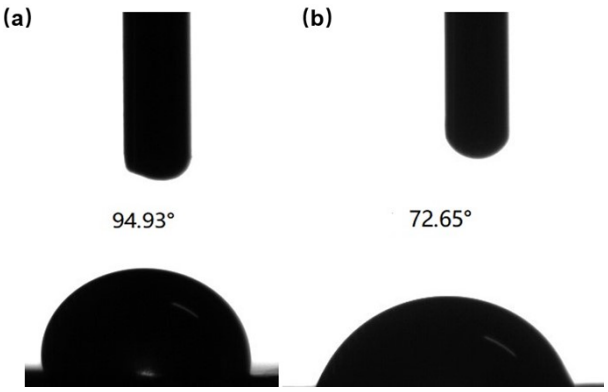

Fig. S9（a）Instantaneous contact angle of V_2O_5 cathode, and（b）Instantaneous contact angle of MVO@C cathode.

Table S2 Electrode performances of reported vanadium-based materials in AZIBs.

Cathode	Electrolyte	Maximum capacity	Cycle performance	Ref.
$MgxV_2O_5 \cdot nH_2O$	3 M $Zn(CF_3SO_3)_2$	350 mAh g^{-1} at 0.1 A g^{-1}	90 mAh g^{-1} at 5 A g^{-1} after 2000 cycles.	1
C@VO_2@V_2O_5	3 M $Zn(CF_3SO_3)_2$	376 mAh g^{-1} at 0.05 A g^{-1}	160 mAh g^{-1} at 5 A g^{-1} after 2000 cycles	2
$Cu_{0.26}V_2O_5$@C	3 M $Zn(CF_3SO_3)_2$	328.8 mAh g^{-1} at 0.2 A g^{-1}	173.5 mAh g^{-1} at 2 A g^{-1} after 500 cycles	3
ZnVOH/rGO	3 M $Zn(CF_3SO_3)_2$	306 mAh g^{-1} at 0.1 A g^{-1}	210 mAh g^{-1} at 0.1 A g^{-1} after 100 cycles	4
a-V_2O_5	3 M $Zn(CF_3SO_3)_2$	348 mAh g^{-1} at 0.1 A g^{-1}	~80 mAh g^{-1} at 5 A g^{-1} after 2000 cycles	5
P-V_2O_5	3 M $Zn(CF_3SO_3)_2$	322 mAh g^{-1} at 0.1 A g^{-1}	80 mAh g^{-1} at 2 A g^{-1} after 2000 cycles	6
V_2O_5@Graphene	3 M $Zn(CF_3SO_3)_2$	~375 mAh g^{-1} at 0.1 A g^{-1}	305 mAh g^{-1} at 0.1 A g^{-1} after 100 cycles	7
V_2O_5 nanofifiber	3 M $Zn(CF_3SO_3)_2$	226 mAh g^{-1} at 0.294 A g^{-1}	166 mAh g^{-1} at 0.588 A g^{-1} after 500 cycles	8
$Ag_{0.33}V_2O_5$	2 M $Zn(CF_3SO_3)_2$	200 mAh g^{-1} at 0.2 A g^{-1}	~75 mAh g^{-1} at 3 A g^{-1} after 700 cycles	9

$Mn_{0.18}$ V_2O_5@C	**3 M $Zn(CF_3SO_3)_2$**	**380 mAh g^{-1} at 0.1 A g^{-1}**	**161 mAh g^{-1} at 6 A g^{-1} after 2000 cycles**	**This work**

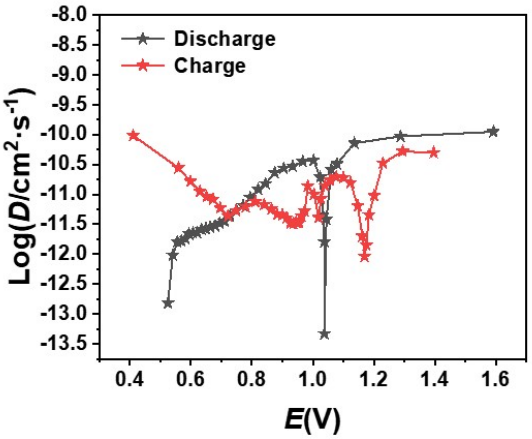

Fig. S10 The GITT curves and the corresponding Zn^{2+} diffusion coefficient of the V_2O_5 electrode.

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