Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Electronic Supporting information for manuscript

Bronze-type vanadium dioxide holey nanobelts as high performing cathode material for aqueous aluminum-ion battery

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Fig. S1. (a) Nitrogen adsorption-desorption isotherm and (b) pore size distribution curve of the VO_2-B sample.

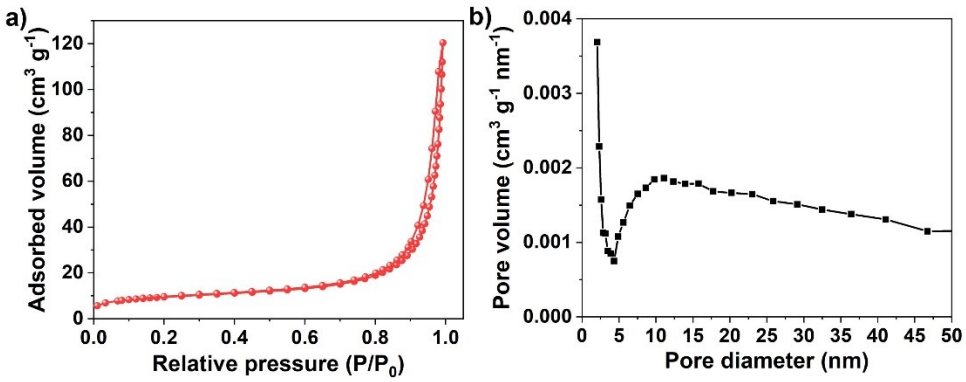

Fig. S2. XPS spectra analysis of the V 2p spectra in VO_2 material.

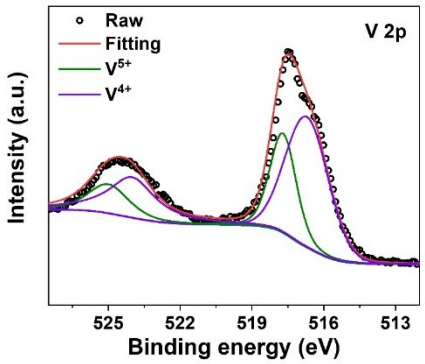

Fig. S3. Cyclic voltammetry (CV) curve of the VO_2-B electrode cycled in 5 m $Al(TOf)_3$ electrolyte at 0.1 mV s^{-1}.

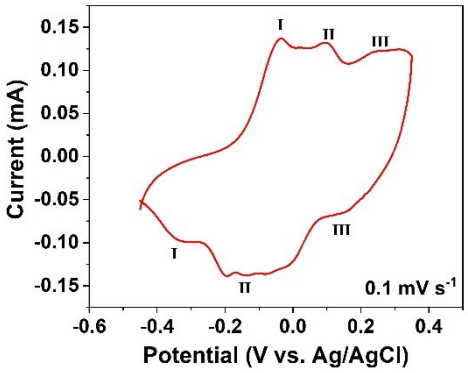

Fig. S4. Rate performance of the VO_2-B cathode in aqueous AIBs.

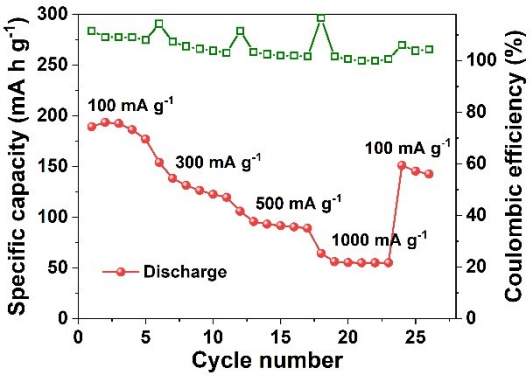

Fig. S5. Galvanostatic discharge/charge curves for aqueous VO_2-B//Al cell at 100 mA g^{-1}.

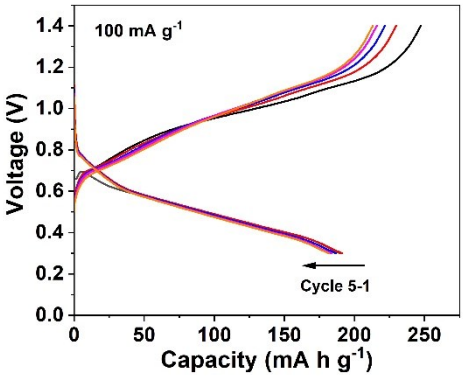

Fig. S6. Comparison of energy densities and power densities reported for aqueous aluminium-ion batteries.

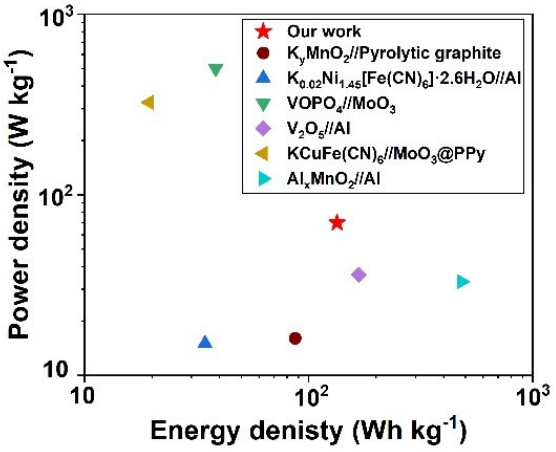

Fig. S7. SEM images of the VO_2-B product after fully discharged.

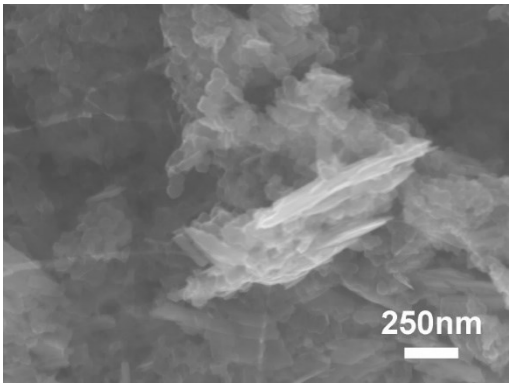

Fig. S8. V 2p XPS spectrum of the fully discharged VO_2-B electrode.

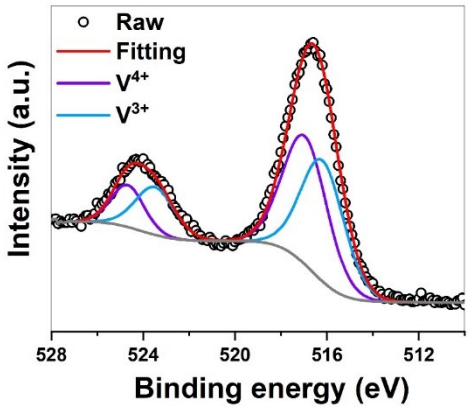

Table S1 Comparison of the electrochemical performance of VO_2 nanosheets with the cathode materials reported for aqueous aluminum ion batteries.

Material	Electrochemical performance	Reference
Our work	A capacity of 234 mAh g^{-1} at 150 mA g^{-1} An initial capacity of 73.3 mAh g^{-1} at 1 A g^{-1} with a capacity retention of 77.2% over 1000 cycles	
Copper-hexacyanoferrate ($KCu[Fe(CN)_6]\cdot xH_2O$)	60 mAh g^{-1} at 100 mA g^{-1} An initial capacity of 41 mAh g^{-1} at 400 mA g^{-1} with a capacity retention of 55% after 1000 cycles.	1
$FeFe(CN)_6$	An initial capacity of 116.29 mAh g^{-1} at 150 mA g^{-1} with a capacity retention of 66.3% after 100 cycles.	2
MnO_2	An initial capacity of 109 mAh g^{-1} at 20 mA g^{-1} with a capacity retention of 61.5% after 60 cycles.	3
TiO_2	A capacity of around 180 mAh g^{-1} at 50 mA g^{-1}	4
Graphene	A capacity of around 90 mAh g^{-1} at 500 mA g^{-1}	5
V_2O_5	A capacity of around 140 mAh g^{-1} at 60 mA g^{-1}	6
Bi_2O_3	A capacity of around 71.1 mAh g^{-1} at 1.5 A g^{-1} with a capacity retention of almost 0% after 20 cycles.	7

Table S2 Lattice parameters of the VO_2-B electrode at different states.

	Pristine	Discharge	Charge
a (Å)	12.055(2)	12.047(3)	12.048(5)
b (Å)	3.6928(7)	3.696(1)	3.694(1)
c (Å)	6.421(1)	6.429(1)	6.426(1)
β	107.04(2)	106.97(2)	106.97(3)
V ($Å^3$)	273.3(1)	273.8(1)	273.5(1)
R_{wp}	5.742	6.094	6.071

Supplementary Reference:

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