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Electronic Supplementary Materials

Interfacial polymerization of PEDOT sheath on V_2O_5 nanowires for stable aqueous zinc ions storage

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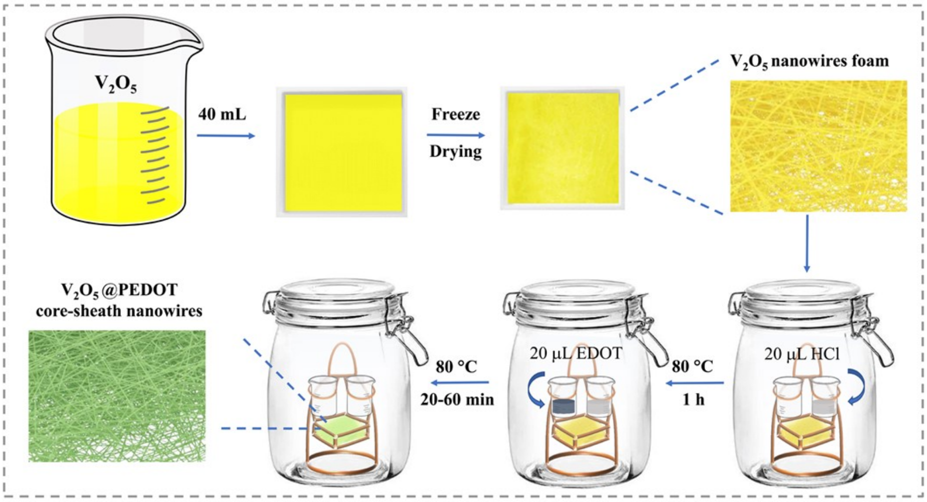

Fig. S1. Schematic diagram showing the preparation process of V_2O_5@PEDOT core-sheath nanowires.

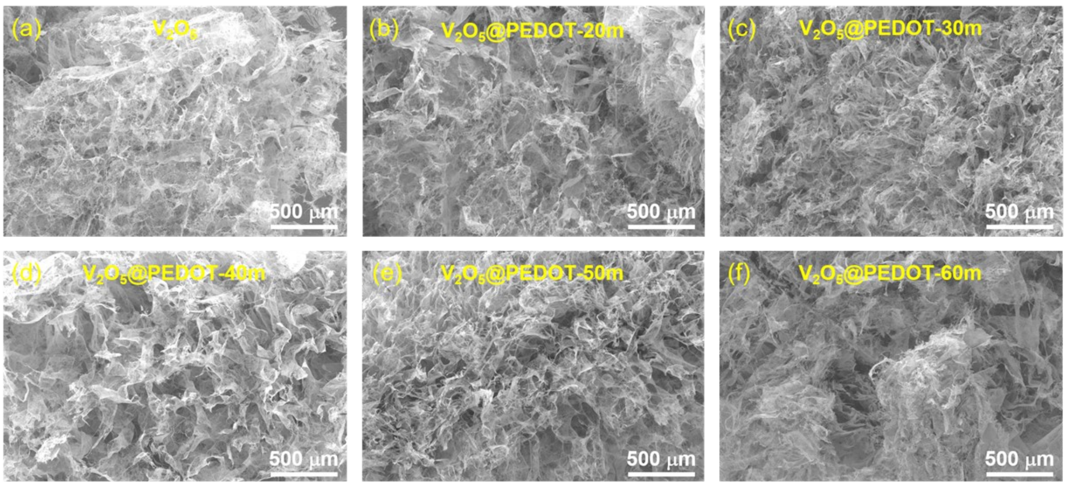

Fig. S2. SEM images V_2O_5 and V_2O_5@PEDOT nanowires aerogel.

Table S1. Elemental composition of V_2O_5 and V_2O_5@PEDOT nanowires based on the XPS analysis.

Samples	V_2O_5	V_2O_5@PEDOT-20m	V_2O_5@PEDOT-30m	V_2O_5@PEDOT-40m	V_2O_5@PEDOT-50m	V_2O_5@PEDOT-60m
V (at%)	25.4	23.0	21.0	19.2	15.9	7.0
O (at%)	26.9	24.9	23.7	23.1	29.6	35.3
C (at%)	47.7	48.9	51.2	51.6	48.1	51.7
S (at%)	0	3.3	4.2	6.2	6.4	6.0
V^{4+}/V (%)	0	13.5	13.7	14.7	16.5	14.6
Average valence state of V	+5.0	+4.87	+4.86	+4.85	+4.83	+4.85

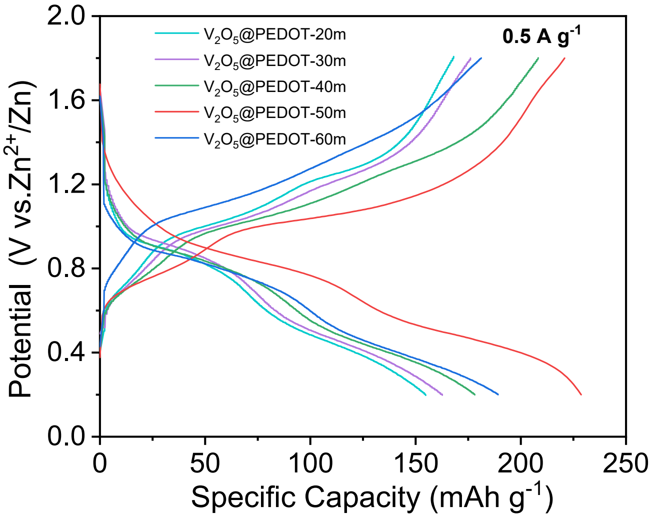

Fig. S3 The charge and discharge curves of V_2O_5@PEDOT nanowires electrode at current density of 0.5 A g^{-1}.

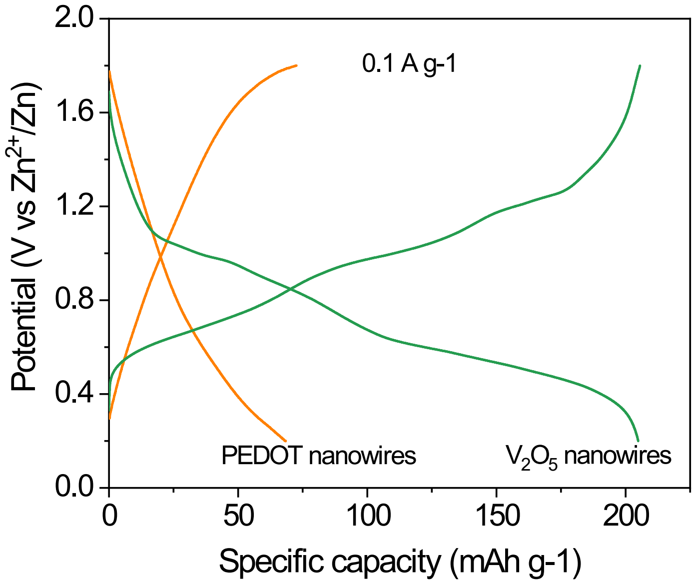

Fig. S4 The charge and discharge curves of V_2O_5 nanowire and PEDOT nanowire electrodes at current density of 0.1 A g^{-1}.

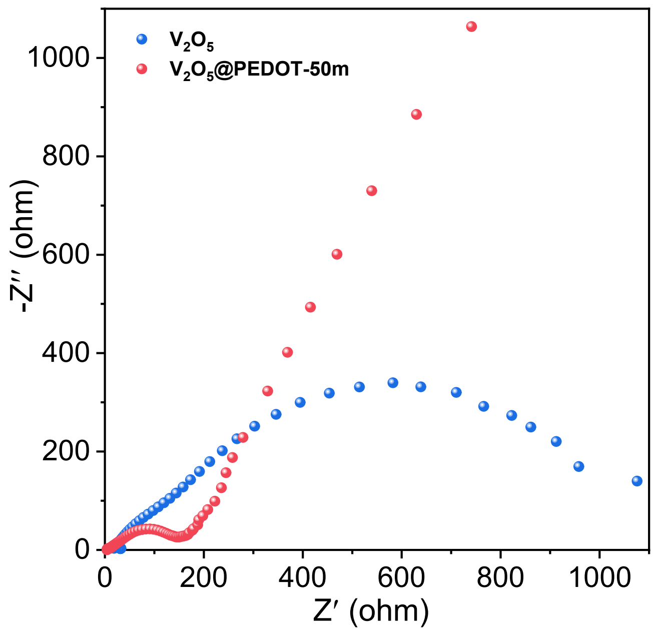

Fig. S5 Nyquist plots of V_2O_5 and V_2O_5@PEDOT-50m nanowires electrodes.

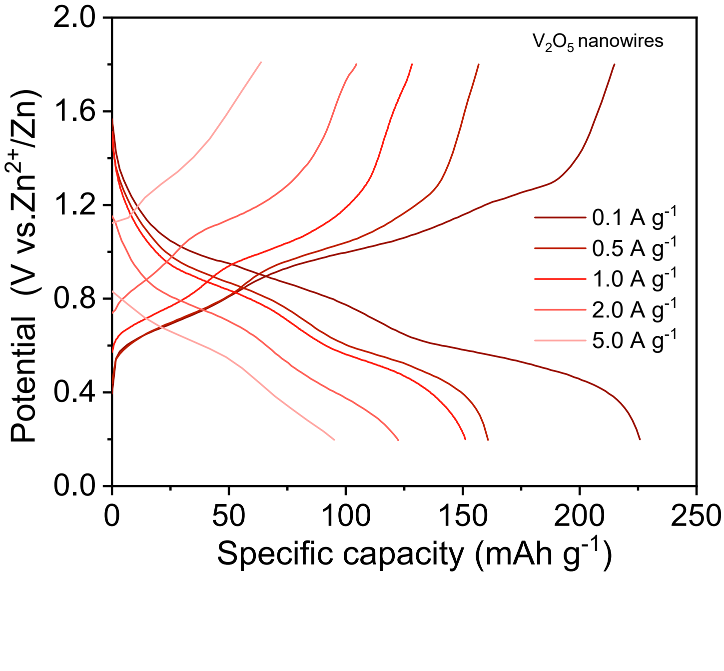

Fig. S6 The charge and discharge curves of V_2O_5 nanowire at various current densities.

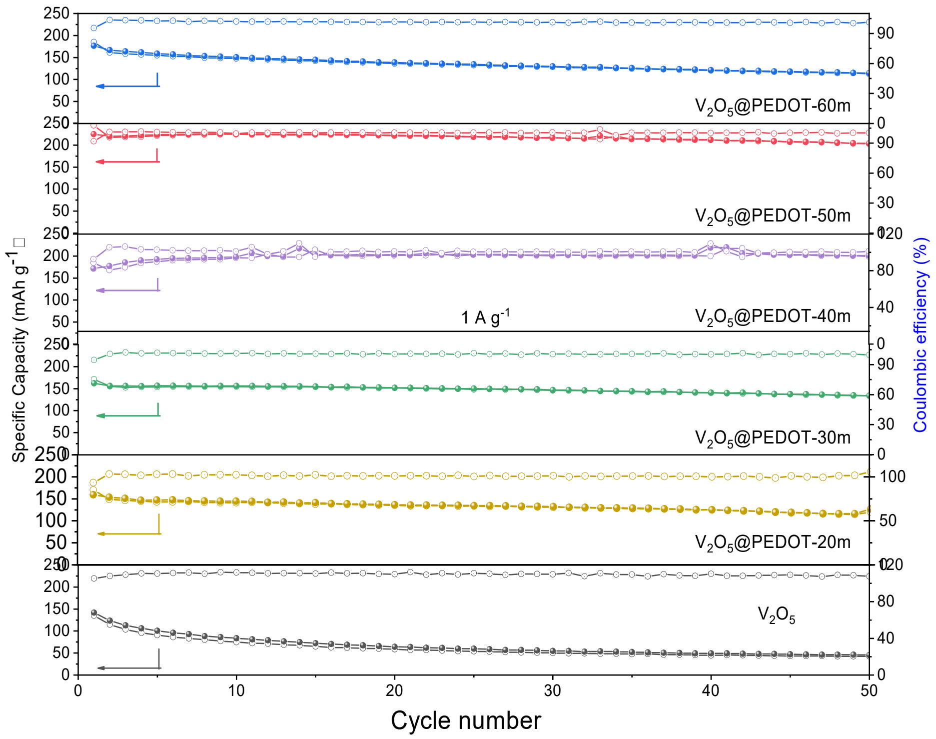

Fig. S7 Cycling performance of V_2O_5@PEDOT nanowires electrodes at 1 A g^{-1}.

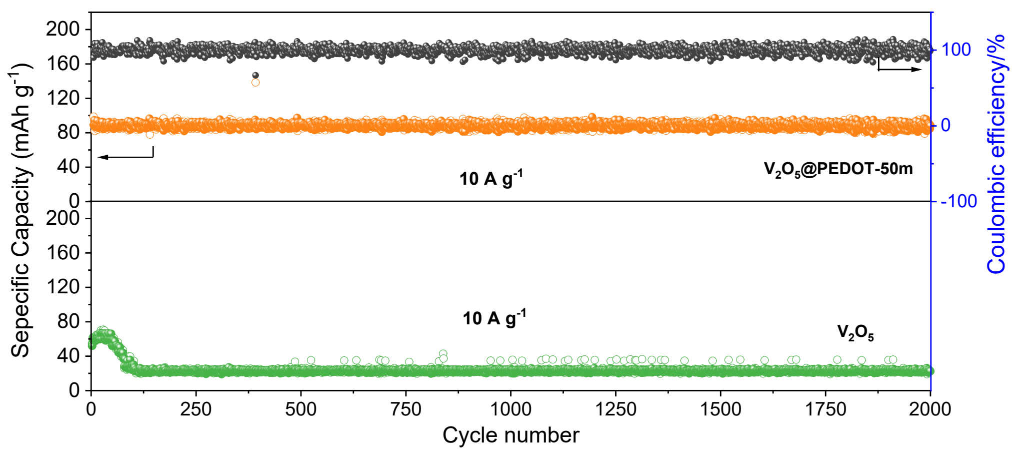

Fig. S8 Cycling performance of V_2O_5@PEDOT-50m and V_2O_5 nanowire electrodes at 10 A g^{-1} for 2000 cycles.

Table 2 Performance comparisons of V_2O_5@PEDOT-50m nanowires electrode with previous cathodes.

Cathodes	Voltage window	Electrolyte	Specific Capacitance (mAh g^{-1})	Cycle performance	Ref.
3D@V_2O_5	0.2-1.6 V	2 M $ZnSO_4$	425 mAh g^{-1} at 0.3 A g^{-1}	78.5% over 200 cycles at 3 A g^{-1}	1
PANI/V_2O_5	0.4-1.6 V	2 M $Zn(CF_3SO_3)_2$	448 mAh g^{-1} at 0.1 A g^{-1}	93.9% over 100 cycles at 0.1 A g^{-1}	2
PPy@V_2O_5/CC	0.2-1.6 V	3 M $ZnSO_4$	283 mAh g^{-1} at 0.1 A g^{-1}	72% over 100 cycles at 0.1 A g^{-1}	3
$V_2O_5\cdot nH_2O$/graphene	0.2-1.6 V	3 M $Zn(CF_3SO_3)_2$+0.1 M Vanadium sol	372 mAh g^{-1} at 0.3 A g^{-1}	71% over 900 cycles at 4 A g^{-1}	4
$H_2V_3O_8$/Graphene	0.2-1.6 V	3 M $Zn(CF_3SO_3)_2$	394 mAh g^{-1} at 0.1 A g^{-1}	87% over 2000 cycles at 6 A g^{-1}	5
V_2O_5	0.5-1.5 V	3 M $Zn(CF_3SO_3)_2$	319 mAh g^{-1} at 0.02 A g^{-1}	81% over 500 cycles at 588 mA g^{-1}	6
Porous V_2O_5 microspheres	0.2-1.6 V	2 M $Zn(CF_3SO_3)_2$	401mAh g^{-1} at 0.1 A g^{-1}	73% over 1000 cycles at 2 A g^{-1}	7
MgV_2O_4	0.2-1.4 V	2 M $Zn(CF_3SO_3)_2$	272 mAh g^{-1} at 0.2 A g^{-1}	64.5% over 500 cycles at 4 A g^{-1}	8

$Ca_{0.2}V_2O_5 \cdot 0.8H_2O$	N/A	1 M ZnCl	296 mAh g^{-1} at 0.05 A g^{-1}	51.1% over 150 at 0.05 A g^{-1}	9
E-MoS_2	0.3-1.5 V	2 M $ZnSO_4$	202.6 mAh g^{-1} at 0.1 A g^{-1}	98.6% over 600 cycles at 0.1 A g^{-1}	10
MnO_2/MXene superlattice			351 mAh g^{-1} at 0.2 A g^{-1}	88.1% over 5000 cycles at 5 A g^{-1}	11
MnO_2	0.6-1.9 V	1 M $(NH_4)_2SO_4$ +0.1 M $MnSO_4 \cdot H_2O$	365 mAh g^{-1} at 0.5 A g^{-1}	93.3% over 4000 cycles at 4 A g^{-1}	12
V_2O_5@PEDOT-50m	0.2-1.8 V	2 M $Zn(CF_3SO_3)_2$	293 mAh g^{-1} at 0.1 A g^{-1}	97.8% over 100 cycles at 0.1 A g^{-1} 99% over 2000 cycles at 10 A g^{-1}	This work

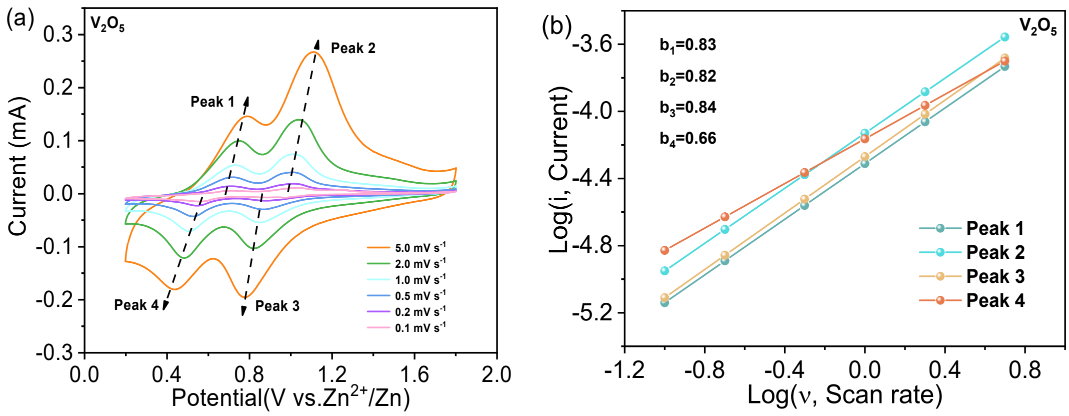

Fig. S9 CV curves of V_2O_5 nanowires at various scan rates (a) and the the linear fitting curves of log(i) vs log(ν) (b).

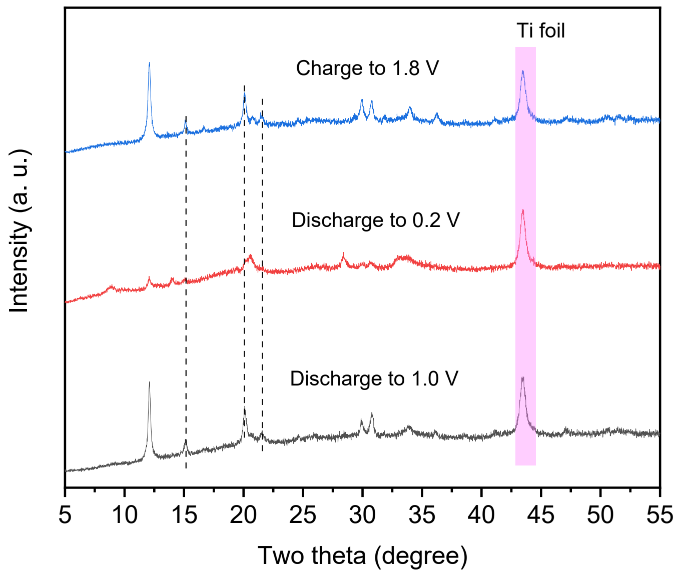

Fig. S10 *Ex-situ* XRD patterns of V_2O_5@PEDOT-50m electrode in the second cycle.

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