

Supplementary Information

Polyaniline and alkali cations co-intercalated V₂O₅ composites with tremelliform nanosheet structure for high performance aqueous zinc-ion batteries

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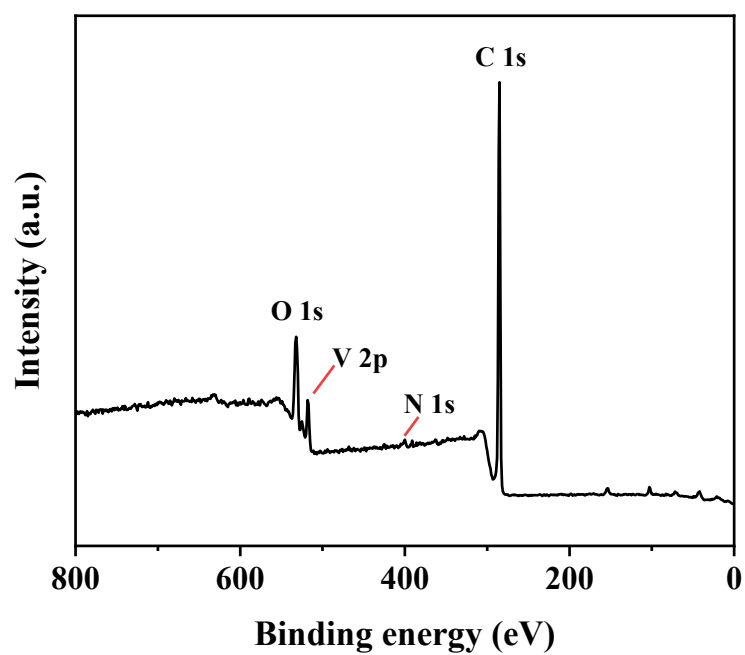


Fig. S1. The XPS survey spectrum of PVO-Li.

Table S1. The atomic percentage of each element obtained from the XPS results of PVO-Li.

Element	Li	V	O	N	C
Atomic percentage	2.02	4.52	12.39	1.18	79.89

Table S2. Electronic conductivities of the five samples at room temperature.

Sample	Electronic conductivity (S cm^{-1})
HVO	4.57×10^{-4}
PVO	3.05×10^{-3}
PVO-Li	8.72×10^{-3}
PVO-Na	8.91×10^{-3}
PVO-K	8.45×10^{-3}

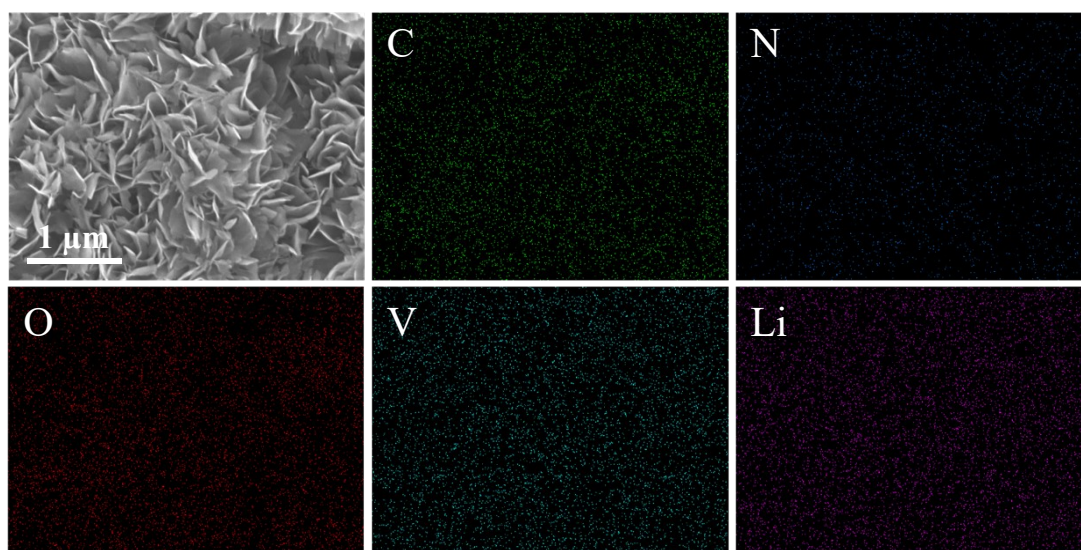


Fig. S2. SEM and EDS mapping images of PVO-Li.

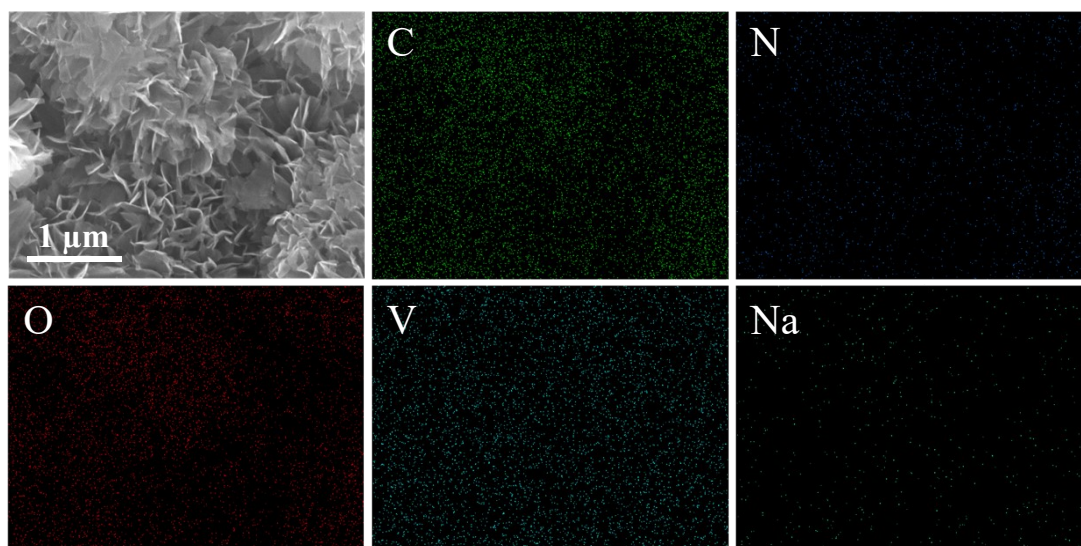


Fig. S3. SEM and EDS mapping images of PVO-Na.

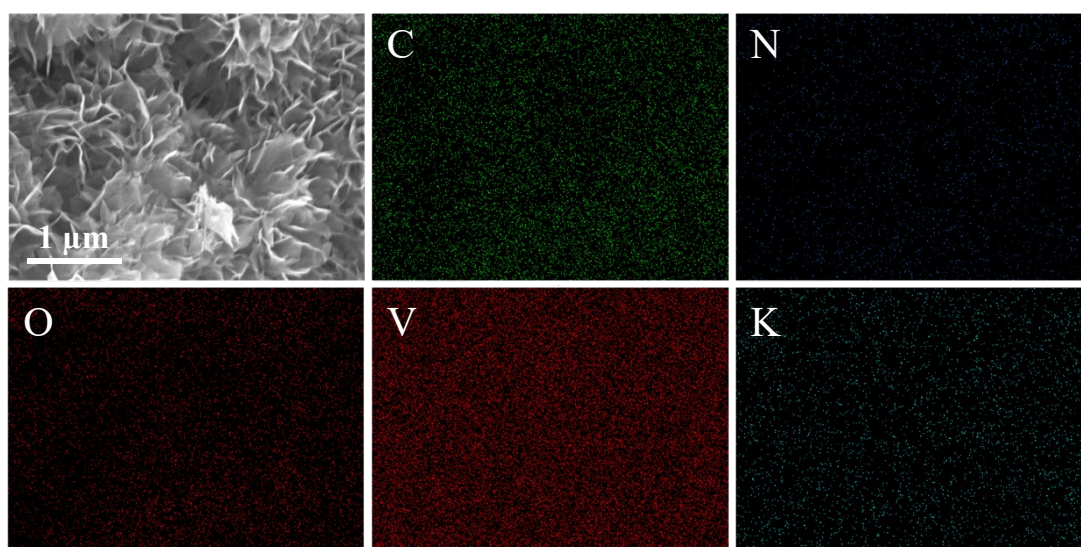


Fig. S4. SEM and EDS mapping images of PVO-K.

Table S3. The content of Li element in the electrolyte and the electrode after 500 cycles at 1 A g^{-1} tested by ICP-MS.

	Content of Li element (μg)
Electrolyte	0.13
Electrode	37.8

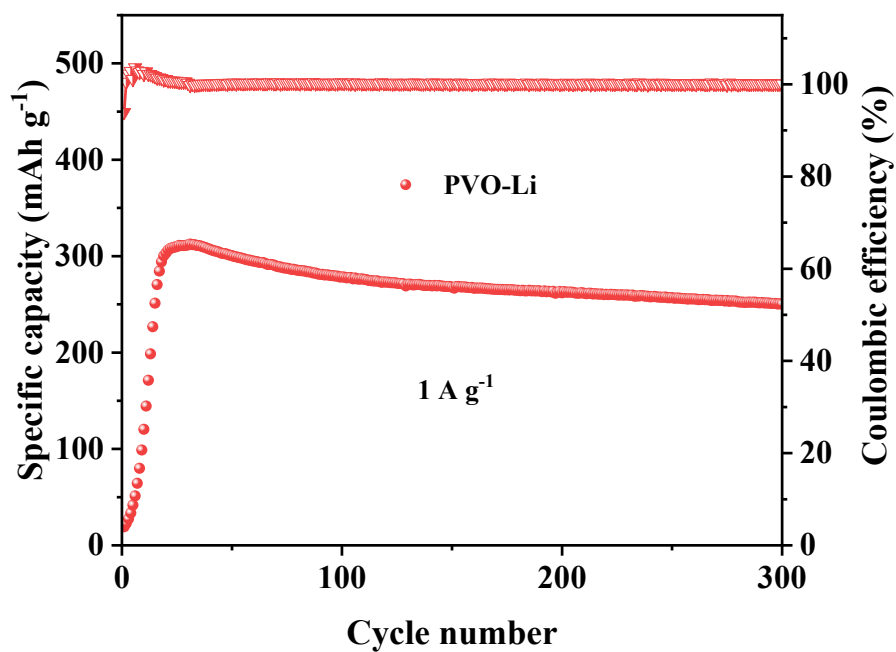


Fig. S5. Cycling performance of the PVO-Li electrode with a mass loading of 6.3 mg cm^{-2} at 1 A g^{-1} .

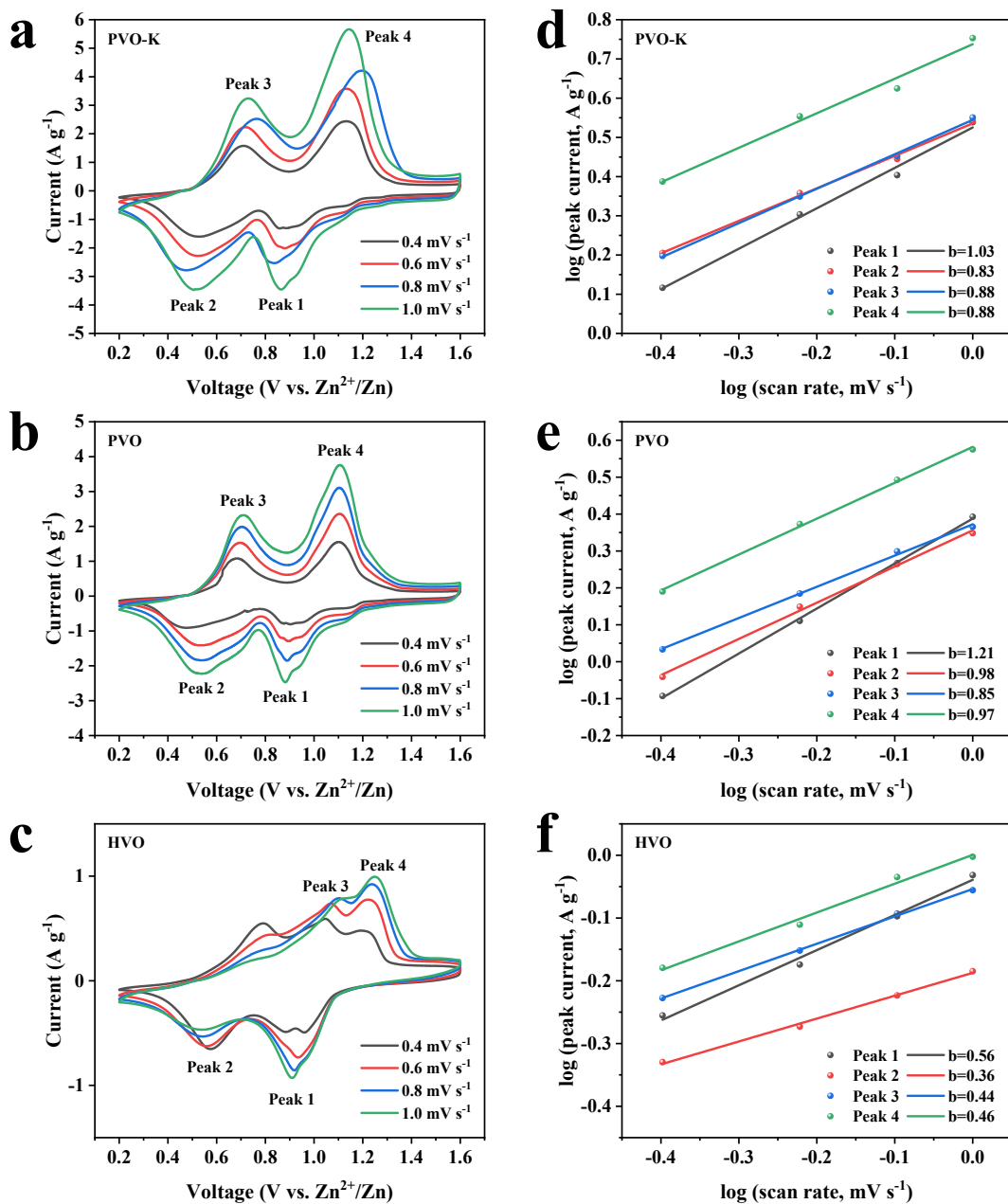


Fig. S6. CV curves of (a) PVO-K, (b) PVO and (c) HVO electrodes at scan rates increasing from 0.4 to 1.0 mV s^{-1} . $\log(\text{peak current})$ vs. $\log(\text{scan rate})$ plots of peaks 1~4 in the CV curves for (d) PVO-K, (e) PVO and (f) HVO electrodes.

Table S4. Charge transfer resistances (R_{ct}) of the five electrodes before and after cycling.

Electrode	R_{ct} (Ω , before cycling)	R_{ct} (Ω , after cycling)
HVO	287.9	26.8
PVO	148.2	16.3
PVO-Li	121.4	6.5
PVO-Na	127.0	9.1
PVO-K	134.1	12.5

Table S5. Comparison of Zn^{2+} diffusion coefficients (D_{Zn}) with other pre-intercalated V_2O_5 cathodes for aqueous zinc-ion batteries.

Cathode	D_{Zn} ($cm^2 s^{-1}$)		Ref.
	Discharge process	Charge process	
PVO-Li	$9.56 \times 10^{-10} \sim 6.00 \times 10^{-9}$	$1.04 \times 10^{-9} \sim 4.43 \times 10^{-9}$	This work
$Li_xV_2O_5 \cdot nH_2O$	$9.5 \times 10^{-9} \sim 3.37 \times 10^{-8}$	$3.3 \times 10^{-9} \sim 2.36 \times 10^{-8}$	1
PANI- V_2O_5	$1.38 \times 10^{-11} \sim 1.02 \times 10^{-10}$	$6.81 \times 10^{-12} \sim 1.70 \times 10^{-10}$	2
PANI- V_2O_5	$1.0 \times 10^{-7} \sim 3.4 \times 10^{-7}$	$1.5 \times 10^{-7} \sim 4.3 \times 10^{-7}$	3
$Zn_{0.25}V_2O_5 \cdot nH_2O$	$\sim 10^{-9} \sim 10^{-10}$		4
PEDOT- V_2O_5	$10^{-6.4} \sim 10^{-7.6}$		5
$Mg_{0.19}V_2O_5 \cdot 0.99H_2O$	$10^{-8.0} \sim 10^{-9.5}$		6
$(TMA_{0.77}Zn_{0.23})V_8O_{20} \cdot 3.8H_2O$	$1.2 \times 10^{-9} \sim 3.6 \times 10^{-11}$		7

Note: PANI, polyaniline; PEDOT, poly(3,4-ethylene-dioxythiophene); TMA, tetramethylammonium.

References

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