

Tuning the electronic structure of layered vanadium pentoxide by pre-intercalation of potassium ions for superior room/low-temperature aqueous zinc-ion batteries

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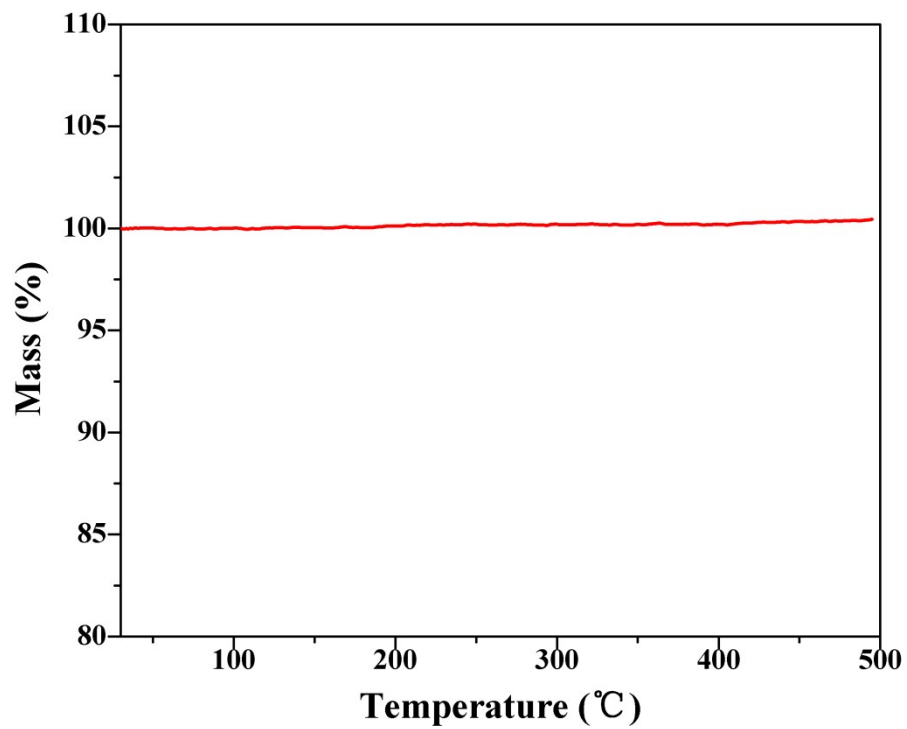


Fig. S1 TGA curves of $K_{0.5}V_2O_5$. The TGA test of $K_{0.5}V_2O_5$ was tested in N_2 from room temperature to 500 °C with a heating rate of 10 °C min^{-1} .

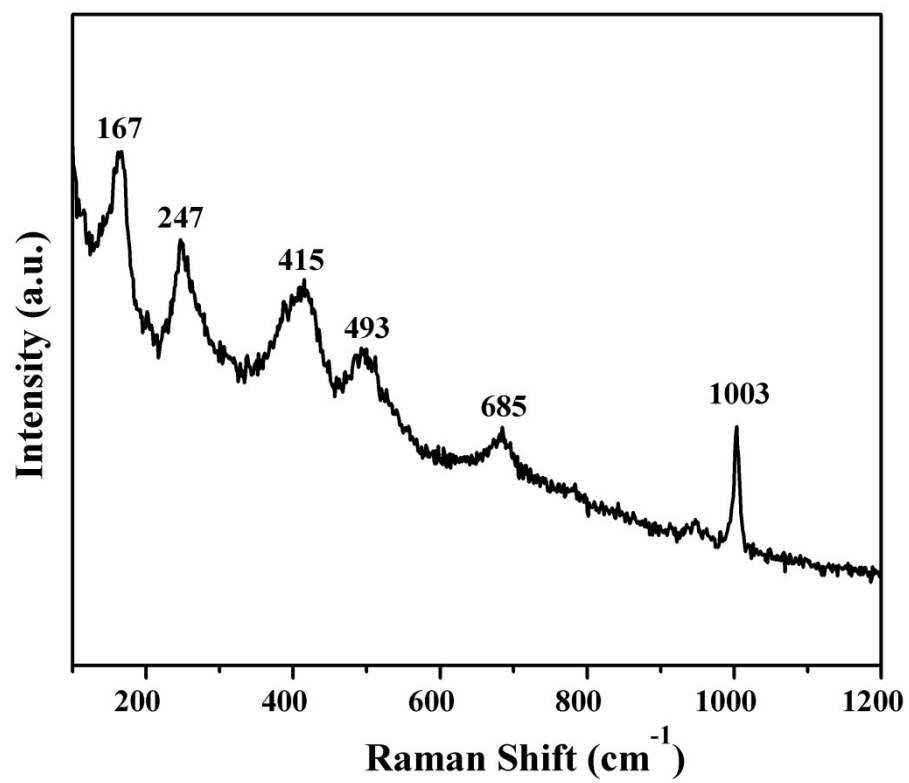


Fig. S2. Raman spectra of the as-prepared $K_{0.5}V_2O_5$ sample.

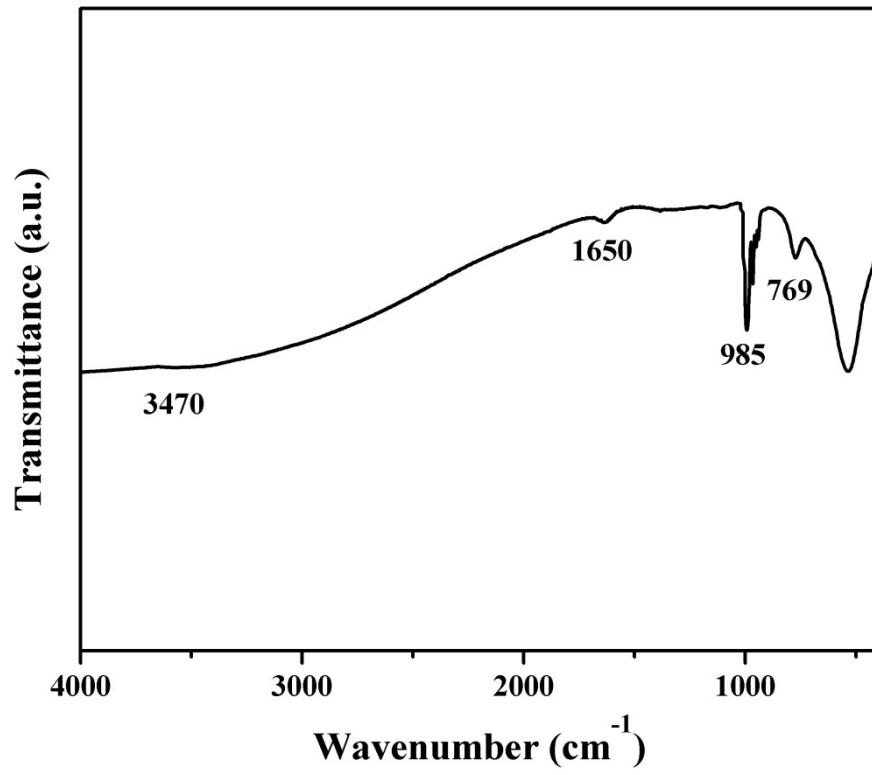


Fig. S3. FT-IR spectrum of $K_{0.5}V_2O_5$.

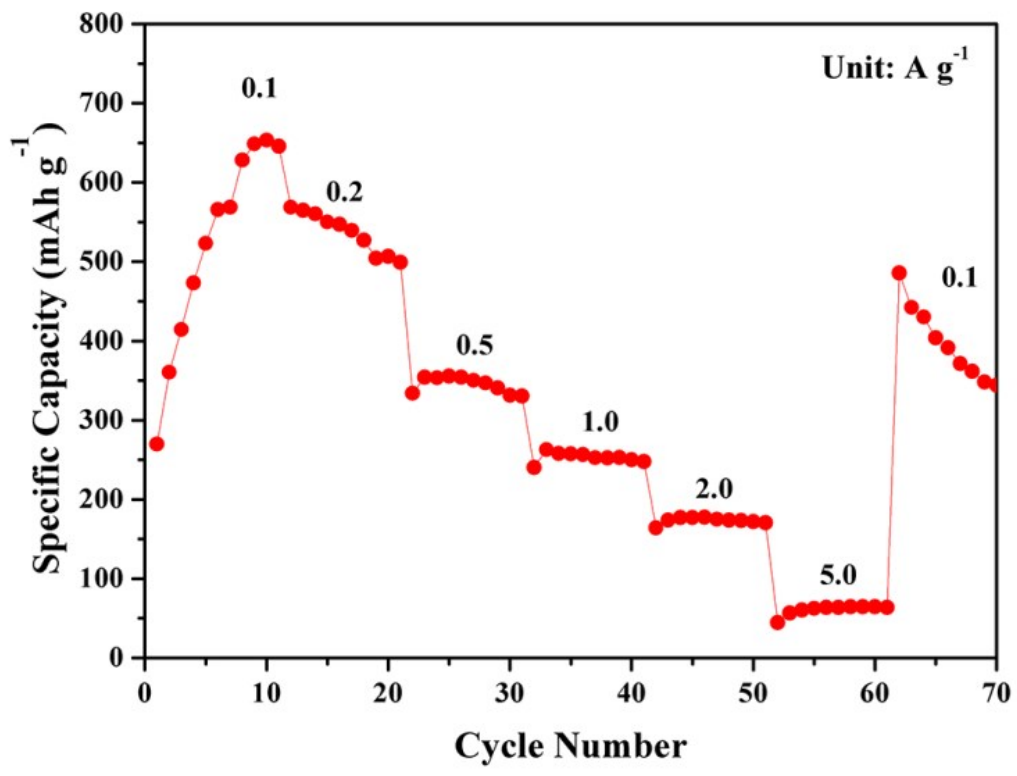


Fig. S4. Rate performance of the commercial V₂O₅.

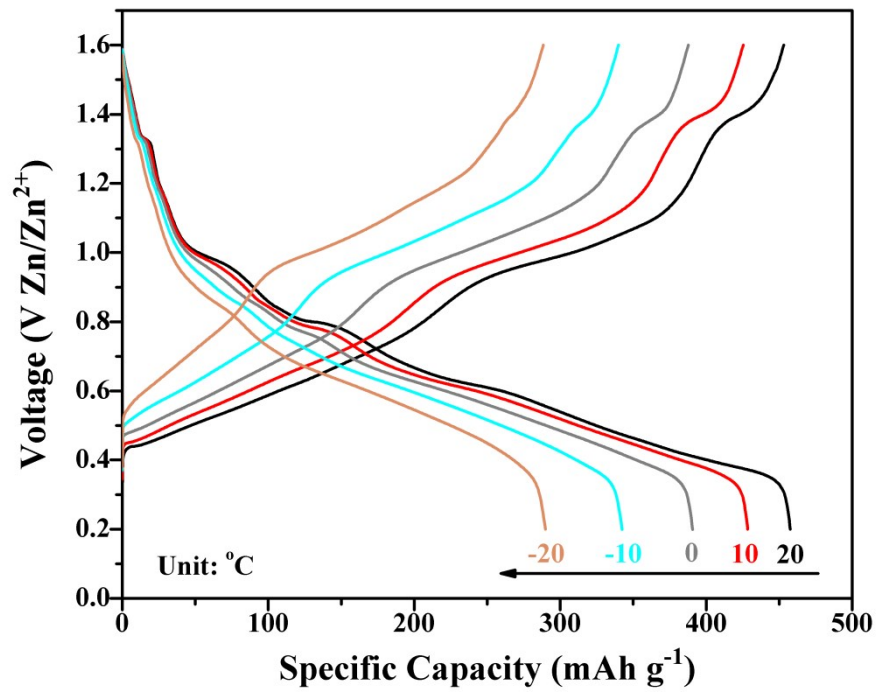


Fig. S5. GCD curves of K_{0.5}V₂O₅ in different temperature at 0.1 A g⁻¹.

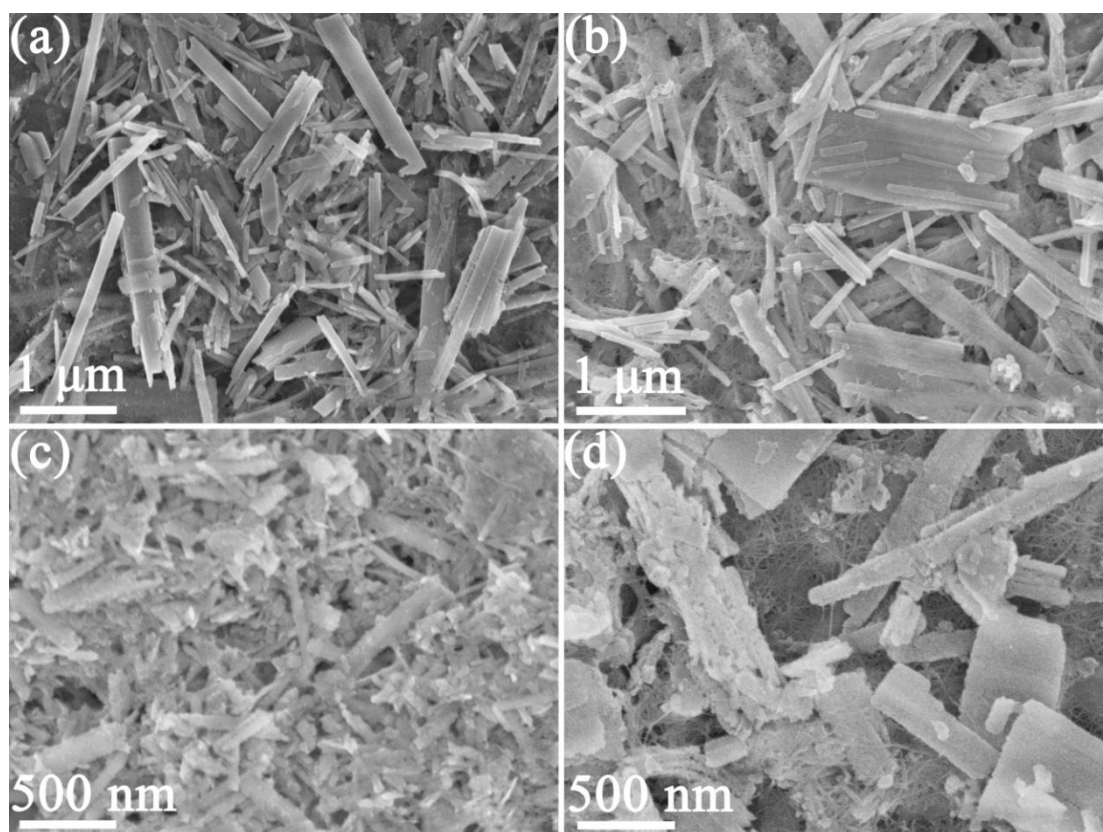


Fig. S6. SEM images of $K_{0.5}V_2O_5$ cathode (a) at pristine and after (b) 10th, (c) 50th and (d) 200th cycles.

Table S1 Electrochemical performance of $K_{0.5}V_2O_5$ electrode with other cathode materials of aqueous ZIBs reported previously.

Cathode materials	Capacity & Rate capability	Mass loading	Ref.
$K_{0.5}V_2O_5$	486 mAh g ⁻¹ (0.1 A g ⁻¹)	1.5 mg cm ⁻²	This work
	256 mAh g ⁻¹ (5 A g ⁻¹)		
V_2O_5	470 mAh g ⁻¹ (0.2 A g ⁻¹)	2 mg cm ⁻²	S1
	400 mAh g ⁻¹ (5 A g ⁻¹)		
$(NH_4)_2V_6O_{16} \cdot 1.5H_2O$	385 mAh g ⁻¹ (0.1 A g ⁻¹)	Not mentioned	S2
	169 mAh g ⁻¹ (5 A g ⁻¹)		
$Zn_{0.3}V_2O_5 \cdot 1.5H_2O$	426.3 mAh g ⁻¹ (0.2 A g ⁻¹)	2 mg cm ⁻²	S3
	334.5 mAh g ⁻¹ (5 A g ⁻¹)		
$V_{10}O_{24} \cdot 12H_2O$	290 mAh g ⁻¹ (0.2 A g ⁻¹)	Not mentioned	S4
	152 mAh g ⁻¹ (2 A g ⁻¹)		
V_2O_5	217 mAh g ⁻¹ (0.1 A g ⁻¹)	Not mentioned	S5
	156 mAh g ⁻¹ (1 A g ⁻¹)		
$Zn_{0.25}V_2O_5 \cdot nH_2O$	282 mAh g ⁻¹ (0.3 A g ⁻¹)	Not mentioned	S6
	183 mAh g ⁻¹ (6 A g ⁻¹)		
$NH_4V_4O_{10}$	126 mAh g ⁻¹ (0.2 A g ⁻¹)	2 mg cm ⁻²	S7
	72 mAh g ⁻¹ (2 A g ⁻¹)		
$Na_{1.1}V_3O_{7.9}@rGO$	164 mAh g ⁻¹ (0.1 A g ⁻¹)	1.2 mg cm ⁻²	S8
	72 mAh g ⁻¹ (2 A g ⁻¹)		

$\text{Li}_x\text{V}_2\text{O}_5 \cdot n\text{H}_2\text{O}$	470 mAh g ⁻¹ (0.5 A g ⁻¹)	0.9-1.2 mg cm ⁻²	S9
	170 mAh g ⁻¹ (10 A g ⁻¹)		
$\text{K}_2\text{V}_6\text{O}_{16} \cdot 2.7\text{H}_2\text{O}$	238.4 mAh g ⁻¹ (0.2 A g ⁻¹)	1.2-1.4 mg cm ⁻²	S10
	178 mAh g ⁻¹ (6 A g ⁻¹)		
$\text{K}_2\text{V}_8\text{O}_{21}$	247 mAh g ⁻¹ (0.3 A g ⁻¹)	Not mentioned	S11
	92 mAh g ⁻¹ (4 A g ⁻¹)		
$\text{H}_2\text{V}_3\text{O}_8$	410.3 mAh g ⁻¹ (0.1 A g ⁻¹)	1.2 mg cm ⁻²	S12
	113.9 mAh g ⁻¹ (5 A g ⁻¹)		
Al-doped	115 mAh g ⁻¹ (0.15 A g ⁻¹)	Not mentioned	S13
	$\text{VO}_{1.52}(\text{OH})_{0.77}$		
$\text{Ag}_{0.4}\text{V}_2\text{O}_5$	360 mAh g ⁻¹ (0.1 A g ⁻¹)	Not mentioned	S14
	180 mAh g ⁻¹ (2 A g ⁻¹)		
$\text{ZnMn}_2\text{O}_4/\text{C}$	123 mAh g ⁻¹ (0.1 A g ⁻¹)	2 mg cm ⁻²	S15
	72 mAh g ⁻¹ (2 A g ⁻¹)		
$\delta\text{-MnO}_2$	217 mAh g ⁻¹ (0.1 A g ⁻¹)	Not mentioned	S16
	61 mAh g ⁻¹ (1 A g ⁻¹)		
$\alpha\text{-MnO}_2$	197 mAh g ⁻¹ (0.133 A g ⁻¹)	Not mentioned	S17
	47 mAh g ⁻¹ (1.666 A g ⁻¹)		

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