

Supplementary Materials

Hierarchical polypyrrole-pillared Na₂V₆O₁₆ architectures enabling high-rate and stable aqueous zinc storage

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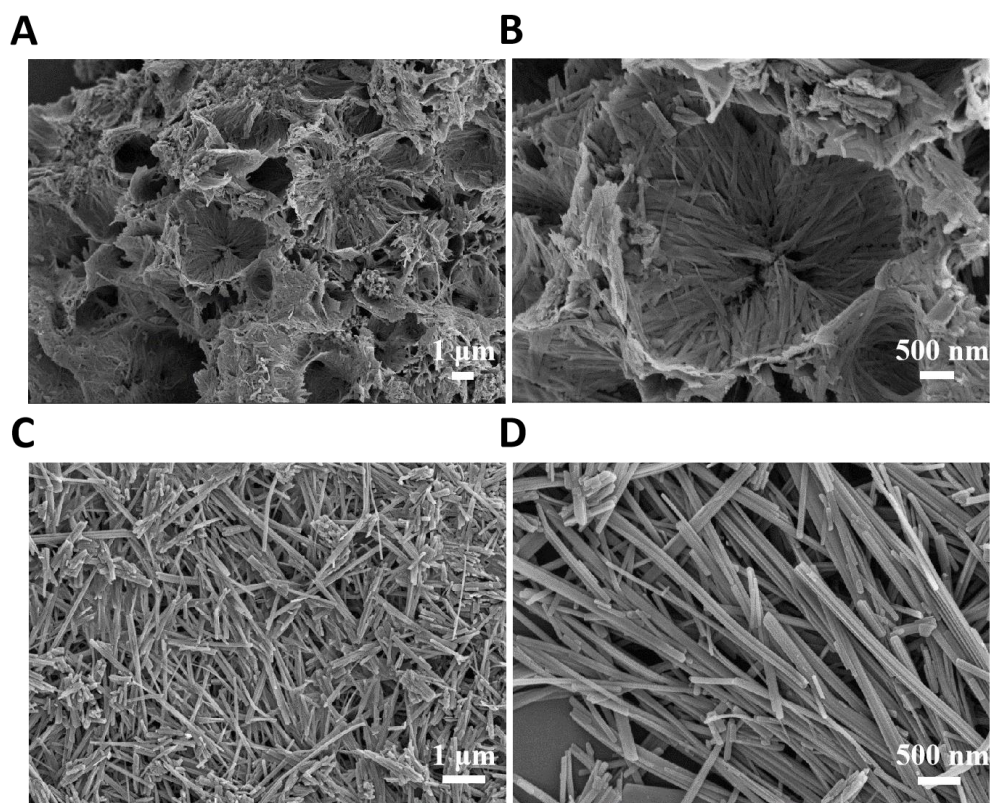


Figure 1. SEM images of (A,B) PPy-NaVO and (C,D) pristine NaVO.

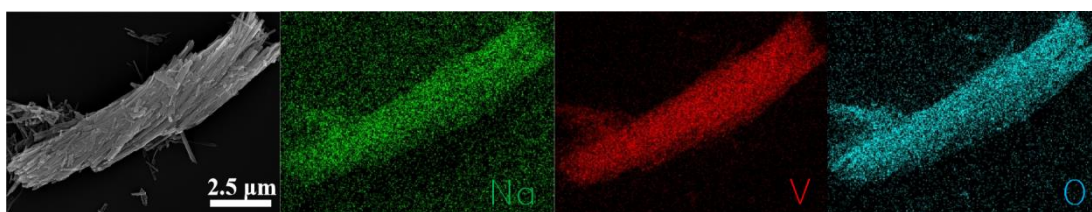


Figure 2. SEM image and the elemental mapping images of NaVO show the distribution of Na, V, and O elements.

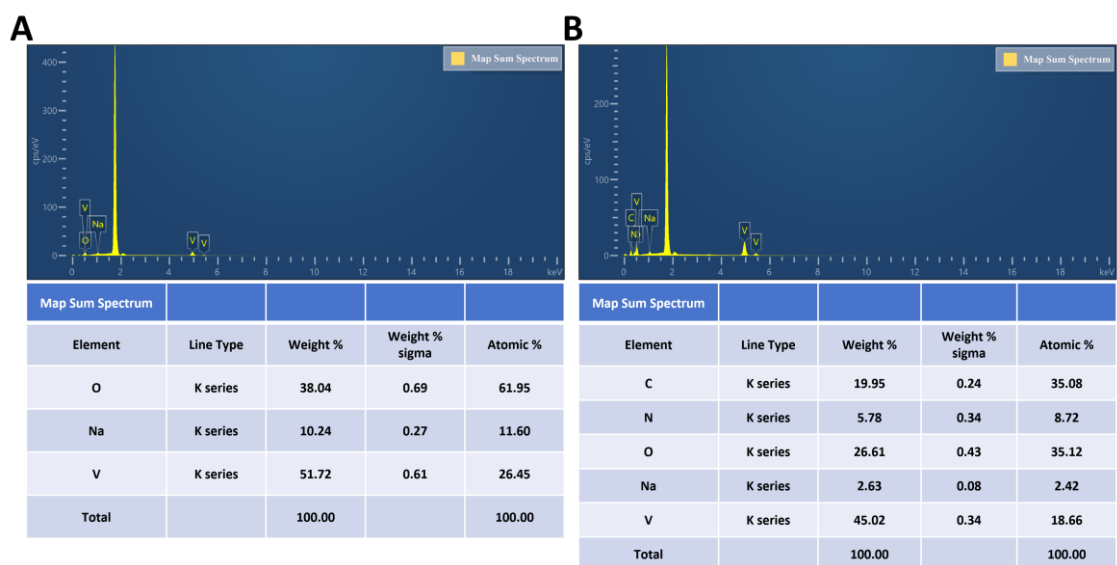


Figure 3. (A-B) EDS images of the NaVO and PPy-NaVO.

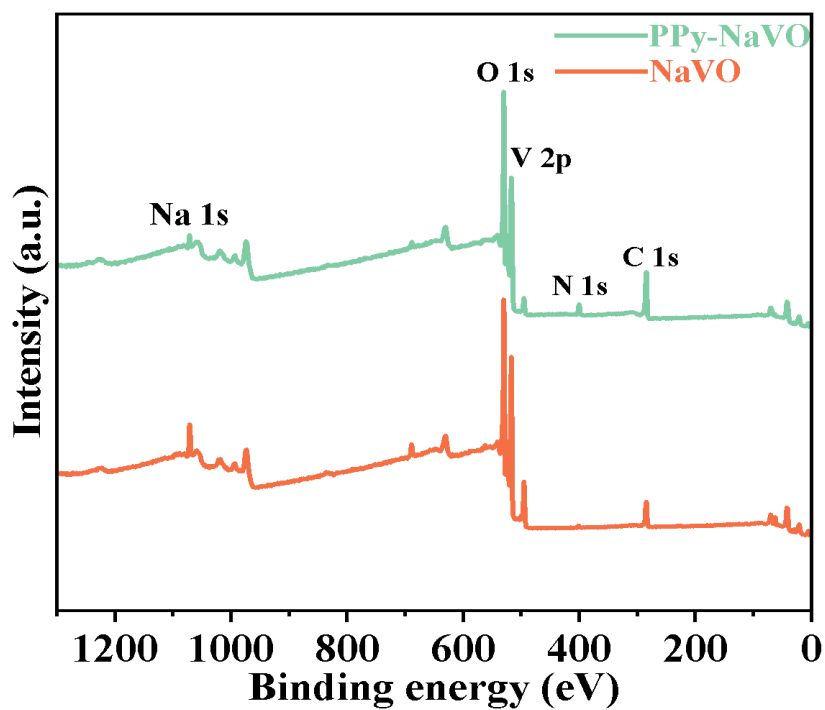


Figure 4. XPS survey spectra of NaVO and PPy-NaVO.

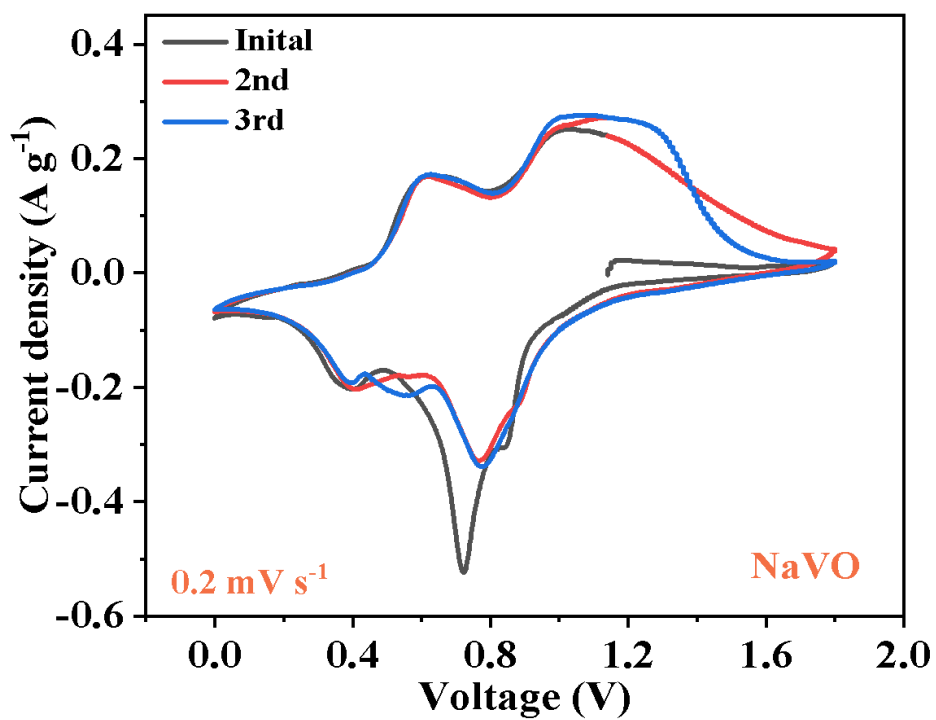


Figure 5. CV curves of NaVO at a scan rate of 0.2 mV s⁻¹.

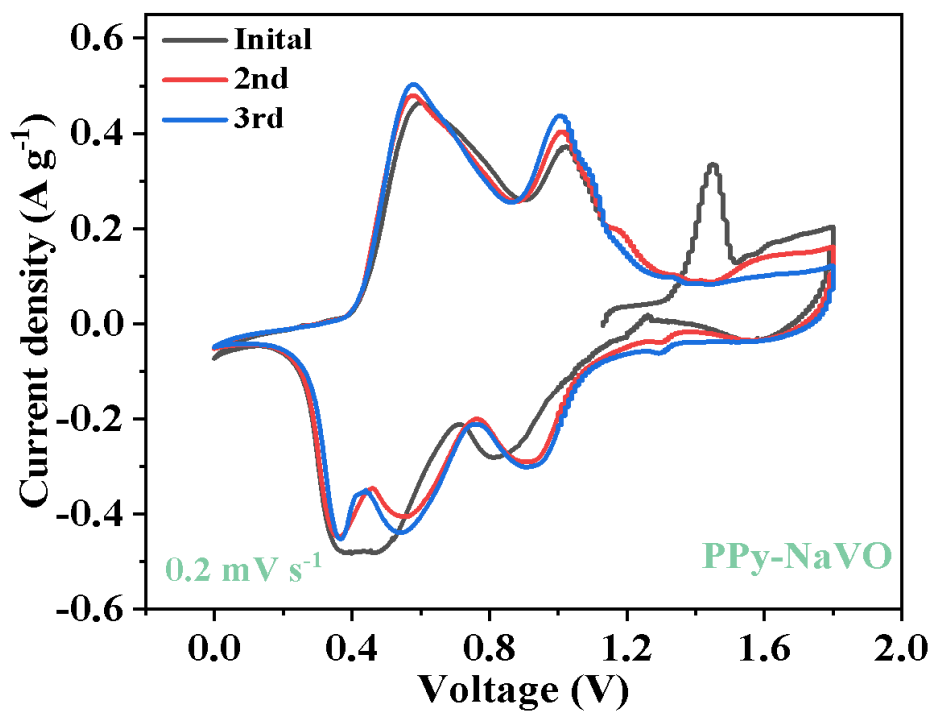


Figure 6. CV curves of PPy-NaVO at a scan rate of 0.2 mV s⁻¹.

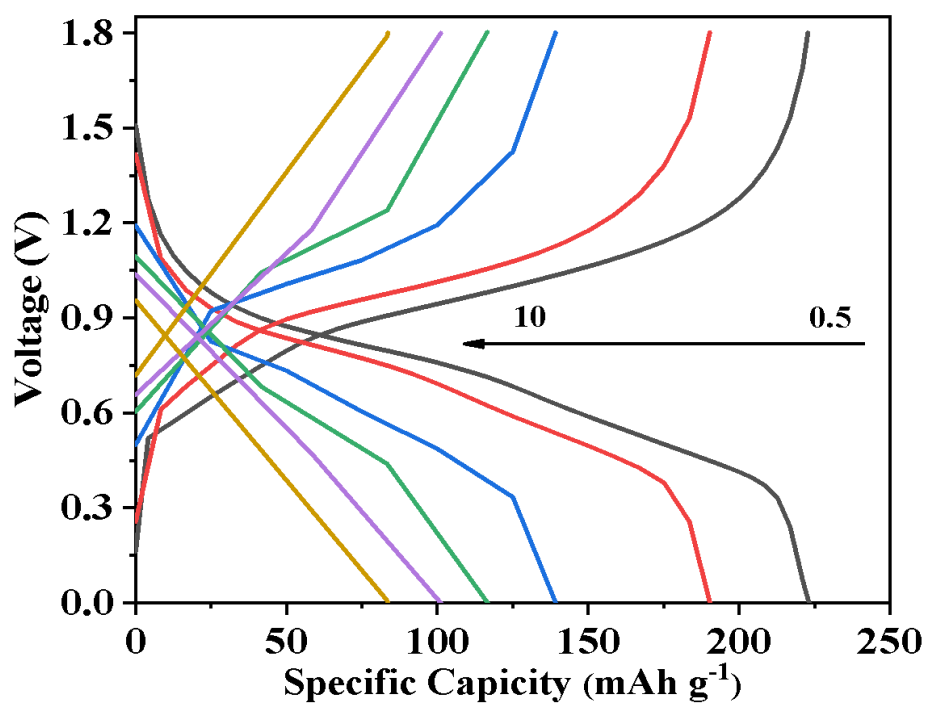


Figure 7. GCD curves of NaVO at current densities from 0.5 to 10.0 A g⁻¹.

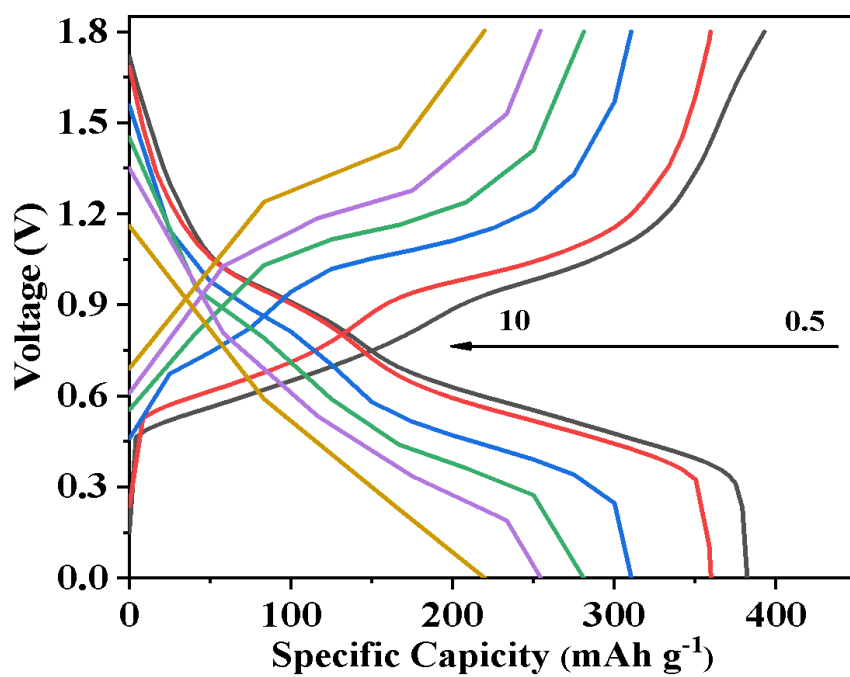


Figure 8. GCD curves of PPy-NaVO at current densities from 0.5 to 10.0 A g⁻¹.

Table 1. Specific capacity comparison of PPy-NaVO with previously reported vanadium-based cathodes for aqueous zinc-ion batteries

Cathode	Electrolyte	Current density (A g ⁻¹)	Capacity (mAh g ⁻¹)	Ref.
PPy-NaVO	3 M Zn(CF ₃ SO ₃) ₂	0.5	382.2	This work
		1	359.8	
		3	310.6	
		5	281.3	
		7	254.6	
		10	219.8	
Na ₅ V ₁₂ O ₃₂	2M ZnSO ₄	0.5	244.5	[1]
		1	199.0	
		2	121.3	
		5	59.7	
HNaV ₆ O ₁₆ ·4H ₂ O	2M ZnSO ₄	0.5	295.4	[1]
		1	207.6	
		2	140.6	
		5	77.8	
Vo ^{••} -PNVO	3 M Zn(CF ₃ SO ₃) ₂	0.4	228.0	[2]
		0.8	224.0	
		1	221.0	
		2	205.0	
		4	165.0	
		0.3	267.0	
BiVO ₄ @VO ₂	2M Zn(CF ₃ SO ₃) ₂	2	229.0	[3]
		5	218.0	
		0.5	261.0	
Na ₂ V ₆ O ₁₆ ·1.63H ₂ O	3 M Zn(CF ₃ SO ₃) ₂	1	219.0	[4]
		2	162.0	
		0.5	261.0	

Zn-V ₁₀ O ₂₄ ·12H ₂ O	3M ZnSO ₄	0.5	284.0	[5]
		1	251.0	
		2	203.0	
		5	121.0	

Table 2. Fitted EIS parameters and chi-square values

Sample	R _s (Ω)	R ₁ (Ω)	R _{CT}	χ ²
NaVO	2.694	5.314	268.8	6.175×10 ⁻³
PPy-NaVO	1.434	7.016	153.7	1.61×10 ⁻³

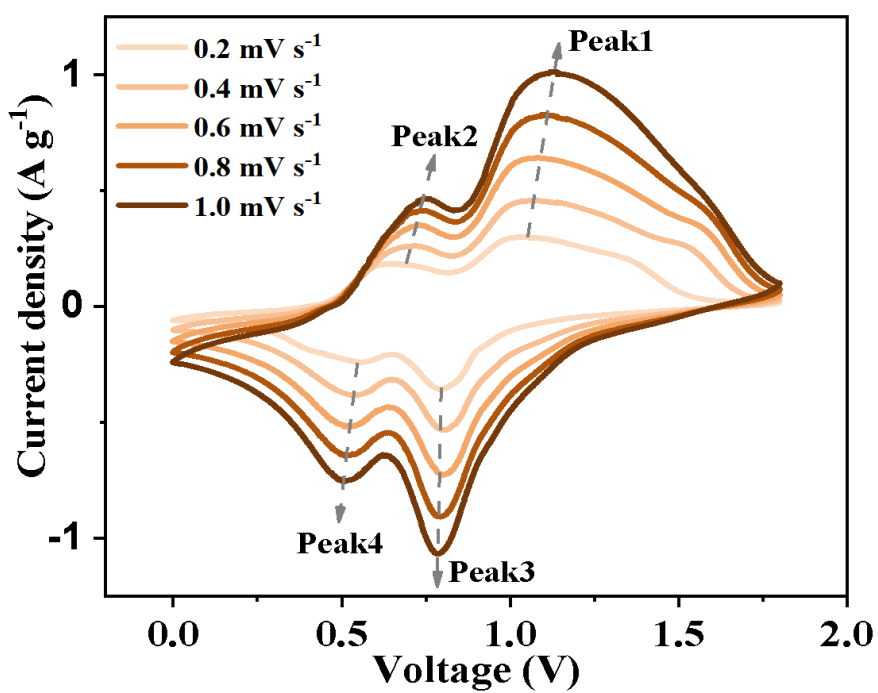


Figure 9. CV curves of NaVO at scan rates from 0.2 to 1.0 mV s⁻¹.

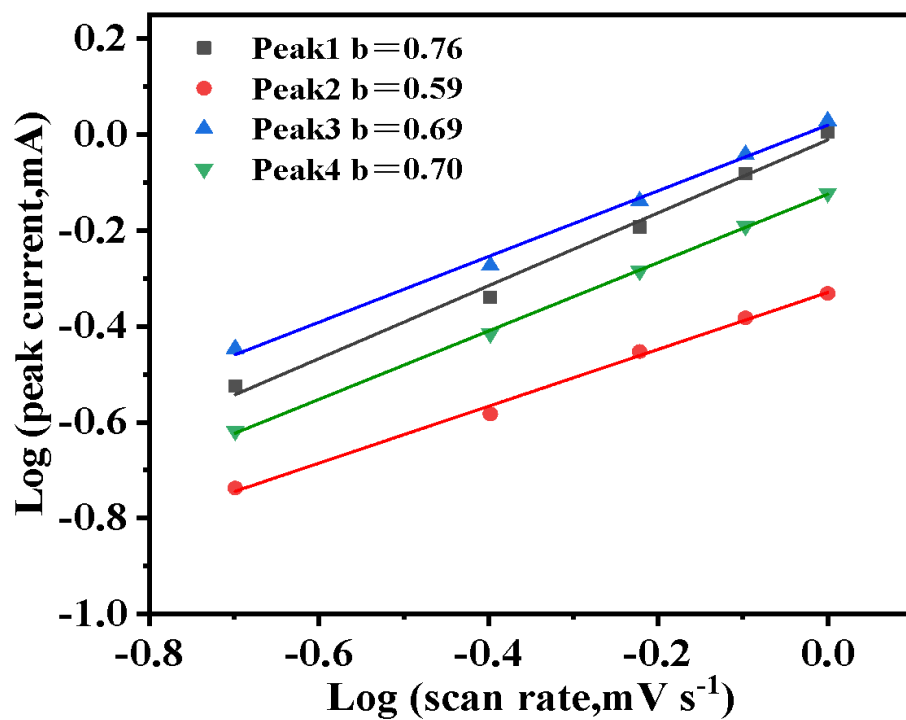


Figure 10. $\log(i)$ vs. $\log(v)$ plots for NaVO.

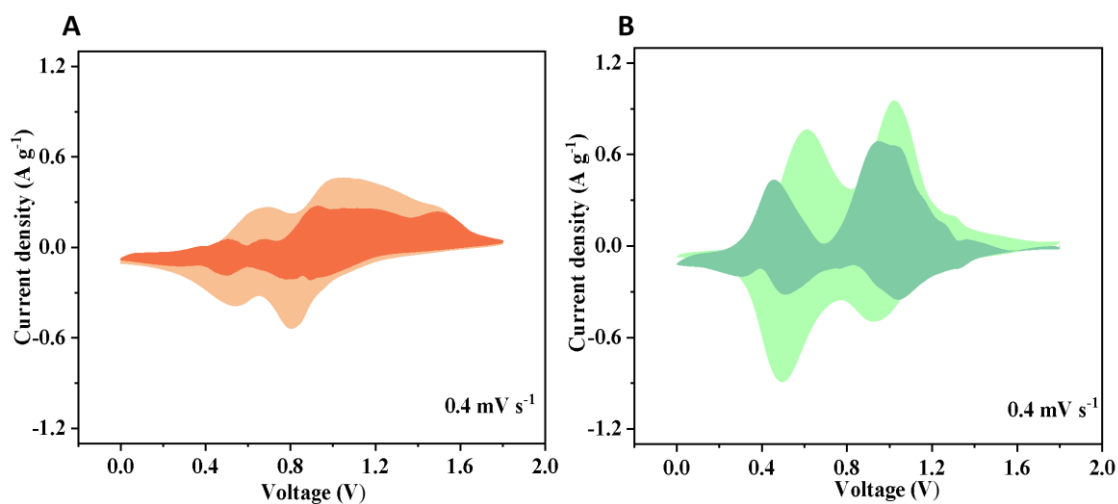


Figure 11. (A) Capacitive contribution of NaVO cathode at 0.4 mV s^{-1} . (B) Capacitive contribution of PPy-NaVO cathode at 0.4 mV s^{-1} .

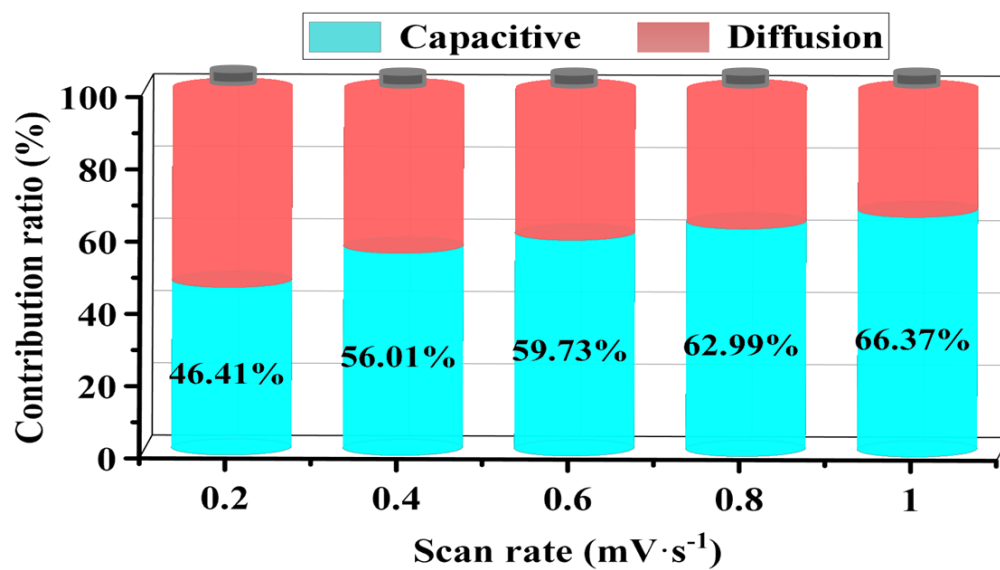


Figure 12. Capacitive contribution of NaVO at different scan rates.

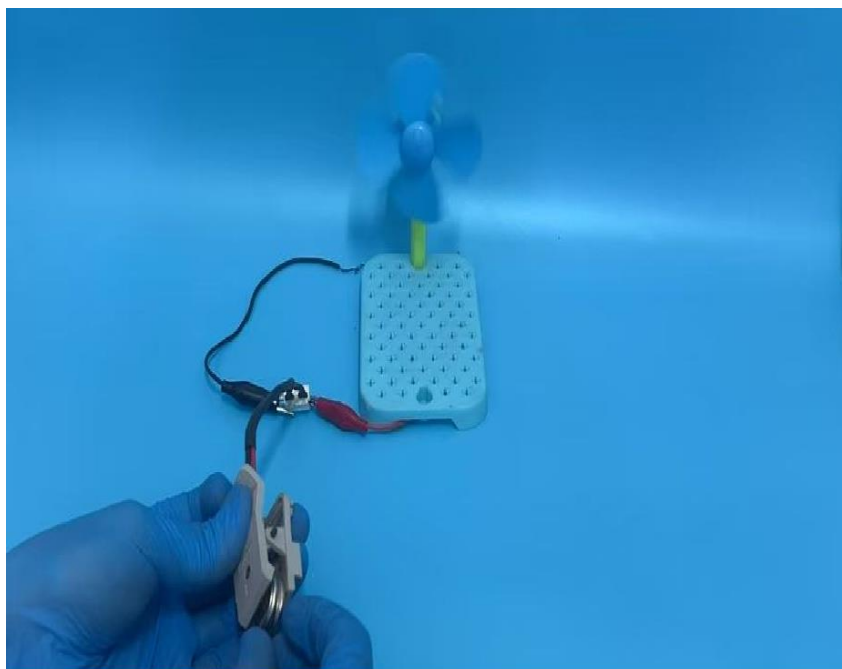


Figure 13. Photograph of two PPy-NaVO//Zn coin cells powering a small fan.

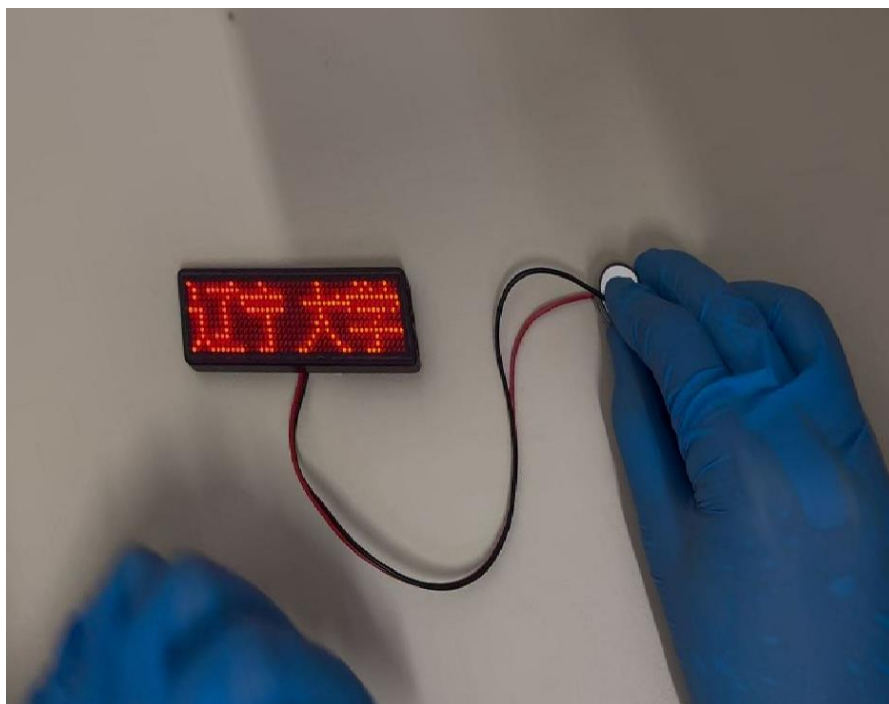


Figure 14. Photograph of three PPy-NaVO//Zn coin cells lighting a LED. The Chinese character in the picture is translated as “Liaoning University”.

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