Supplementary Information (SI) for Journal of Materials Chemistry A.

Creating multi-electron reactions in NASICON-type $Na_7V_4(P_2O_7)_4(PO_4)$ cathode for sodium-ion battery by activating reversible V^{4+}/V^{5+} redox reactions

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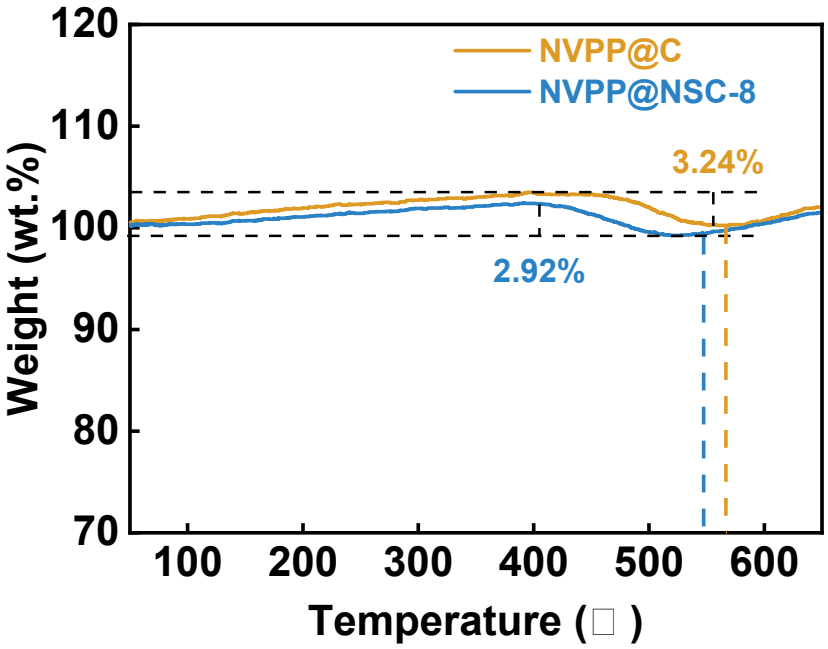

Fig. S1 TGA of NVPP@C and NVPP@NSC-8

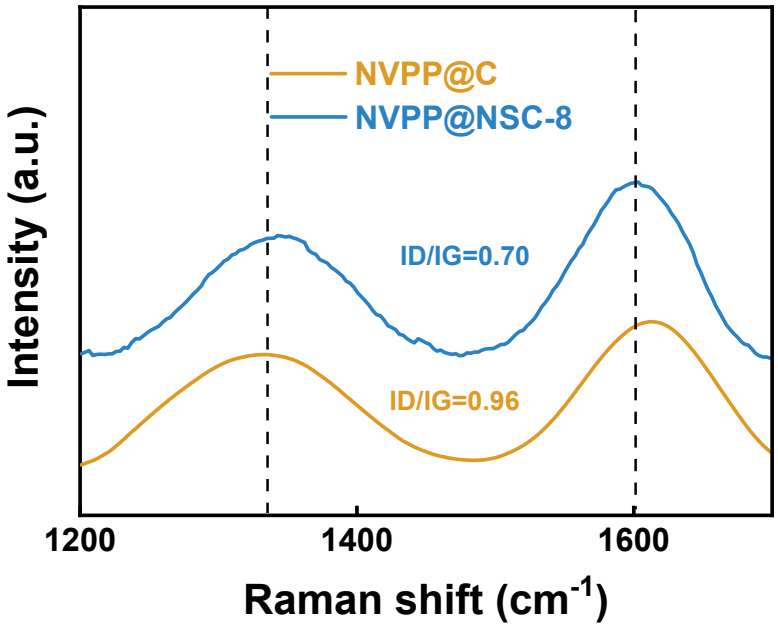

Fig. S2 Raman of NVPP@C and NVPP@NSC-8

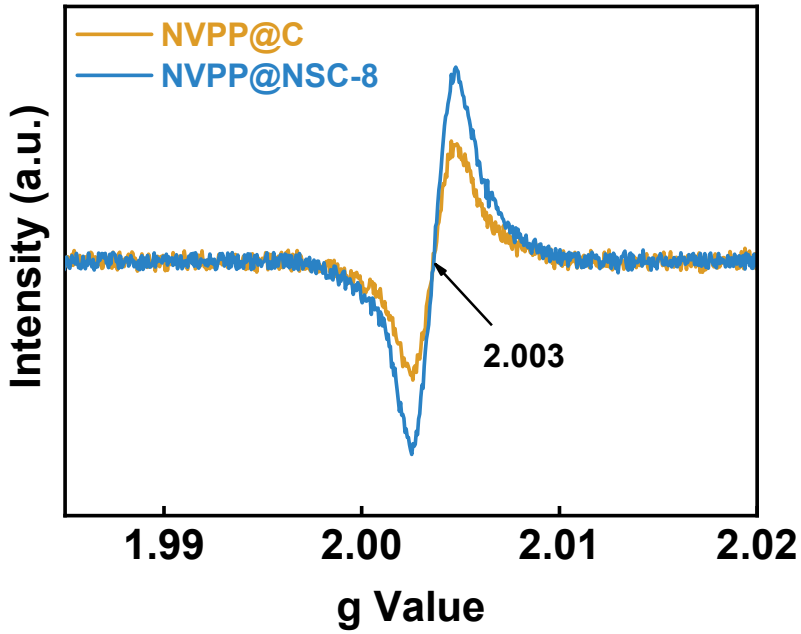

Fig. S3 EPR of NVPP@C and NVPP@NSC-8

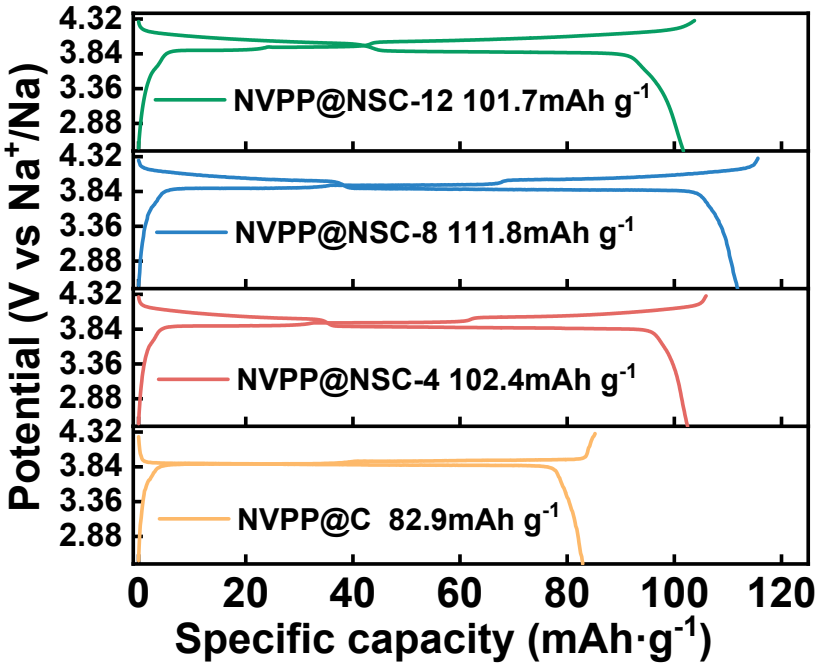

Fig. S4 GCD profiles of the four samples

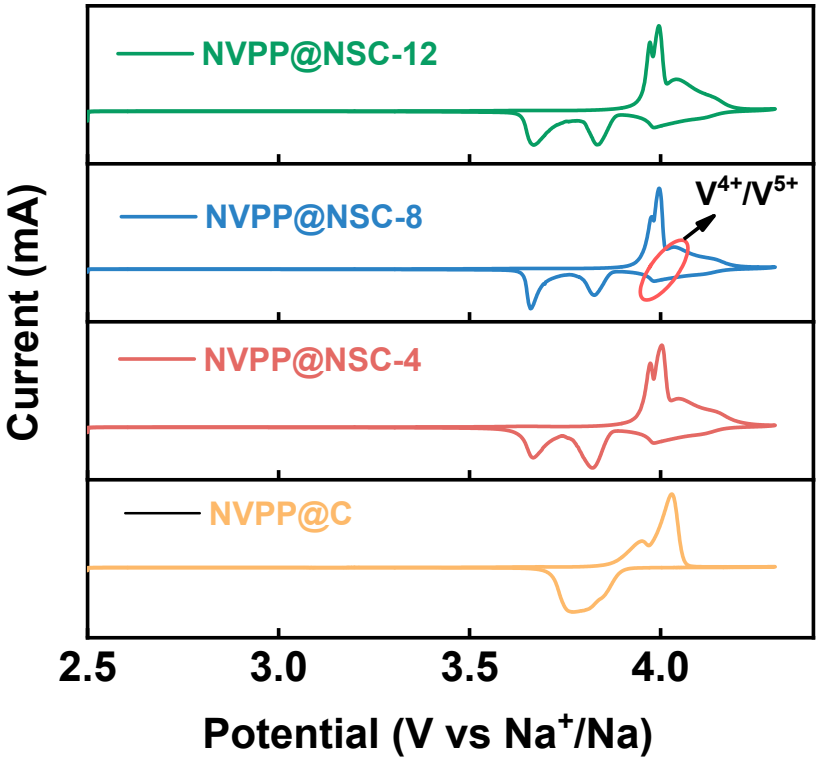

Fig. S5 CV of four samples

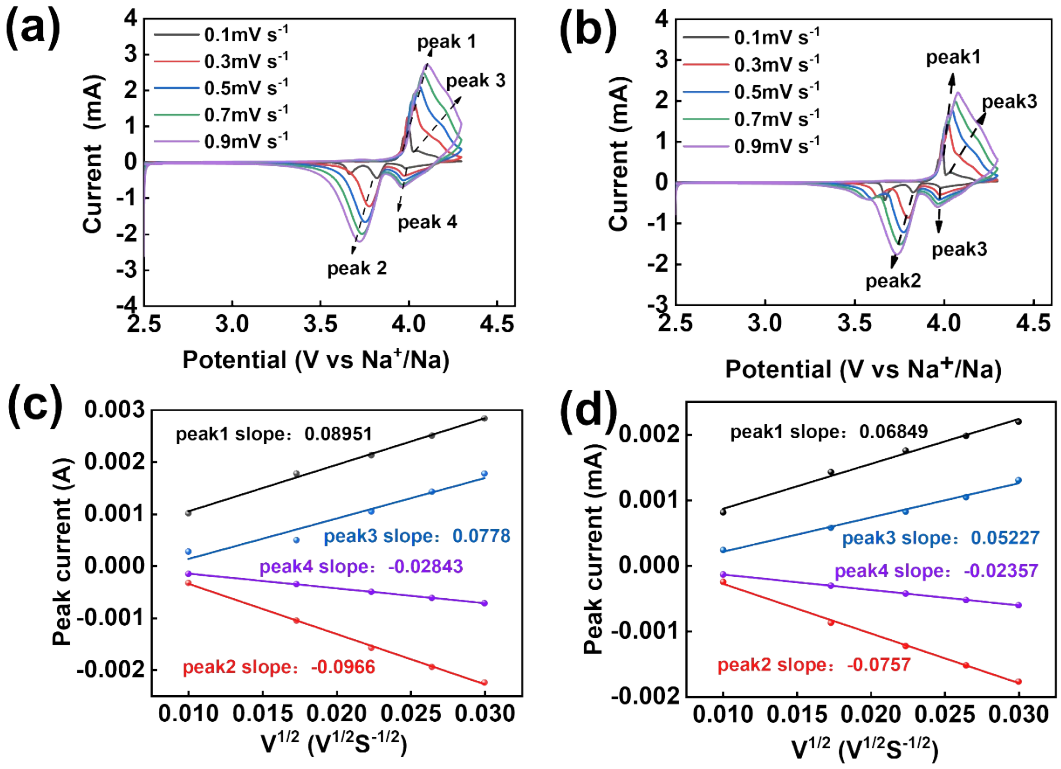

Fig. S6 CV profiles of (a) NVPP@NSC-4 and (b) NVPP@NSC-12 at varying scan rates. Linear relationship between peak current and scan rate for (c) NVPP@NSC-4 and (d) NVPP@NSC-12.

Table S1

Four-point test results

	NVPP	NVPP@NSC-8
1	1.89E-05	4.81E-04
2	1.82E-05	4.69E-04
3	1.76E-05	4.72E-04
4	1.82E-05	4.67E-04
5	1.81E-05	4.69E-04
6	1.88E-05	4.67E-04
7	1.87E-05	4.63E-04
8	1.79E-05	4.69E-04
9	1.80E-05	4.85E-04

Table S2

Comparison of full battery electrochemical performance with recent literature results.

References	Rate (C) / Specific capacity (mAh g^{-1})									
	0.1	0.2	0.5	1	2	5	10	15	20	30
1		92.1	89.3	87.1	86	84.1	82.7		79.5	78.1
2	85	83.5	81.2	78.6	74	69				
3				89.7	86.7	86.1	84.7		70.3	
4	91.8	90.8	88.9	85.2	80.1	76.4	70.2			
5			89.5	84.5		81.9	80.2		70.3	
This work	**113.8**	**113.1**	**111.8**	**109.8**	**106.7**	**101.4**	**94.4**	**90.8**	**87.2**	**80.8**

Table S3

The sodium ion diffusion coefficient (D_{Na^+}) was calculated using the linear relationship between peak current and sweep rate.

samples	D_{Na^+}/peak1	D_{Na^+}/peak2	D_{Na^+}/peak3	D_{Na^+}/peak4
NVPP@C	1.04×10^{-12}	1.67×10^{-12}		
NVPP@NSC-4	3.58×10^{-9}	4.16×10^{-9}	2.77×10^{-9}	3.61×10^{-10}
NVPP@NSC-8	5.15×10^{-9}	6.01×10^{-9}	1.66×10^{-9}	5.16×10^{-10}
NVPP@NSC-12	2.09×10^{-9}	2.56×10^{-9}	1.22×10^{-9}	2.48×10^{-10}

Table S4

Na-O Bond Lengths

Bond	NVPP	NVPP@NSC
Na4-O11	2.22125Å	2.24090Å
Na4-O72	2.37736Å	2.38971Å
Na4-O46	2.34416Å	2.37338Å
Na4-O38	2.65355Å	2.68886Å

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