

# Binder-Driven Cathode–Electrolyte Interphase via Displacement Reaction for High Voltage $\text{Na}_3\text{V}_2(\text{PO}_4)_2\text{F}_3$ Cathode in Sodium-Ion Batteries

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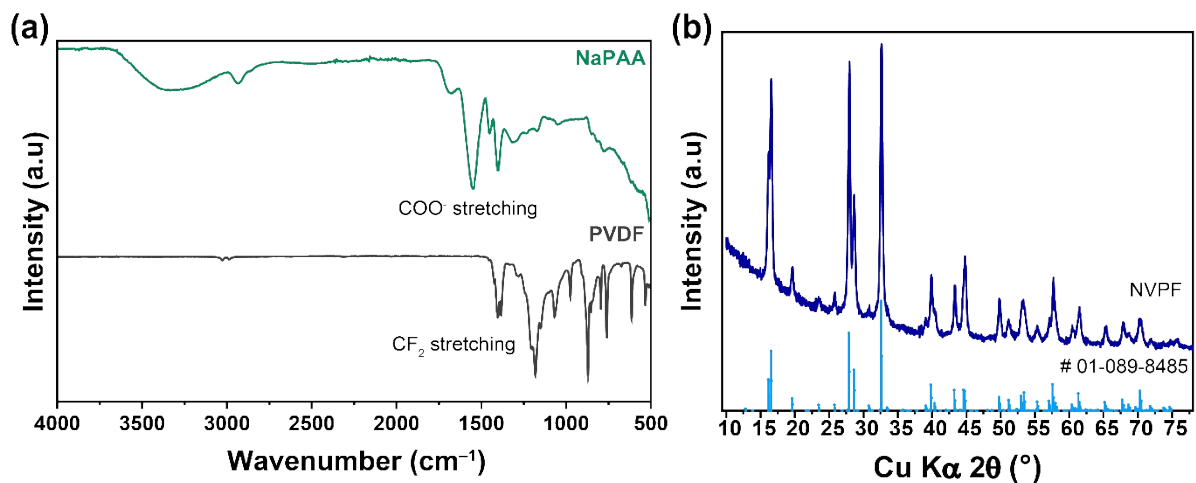


Fig. S1 (a) FT-IR spectra and (b) XRD profile of synthesized NVPF of NaPAA and PVDF binders.

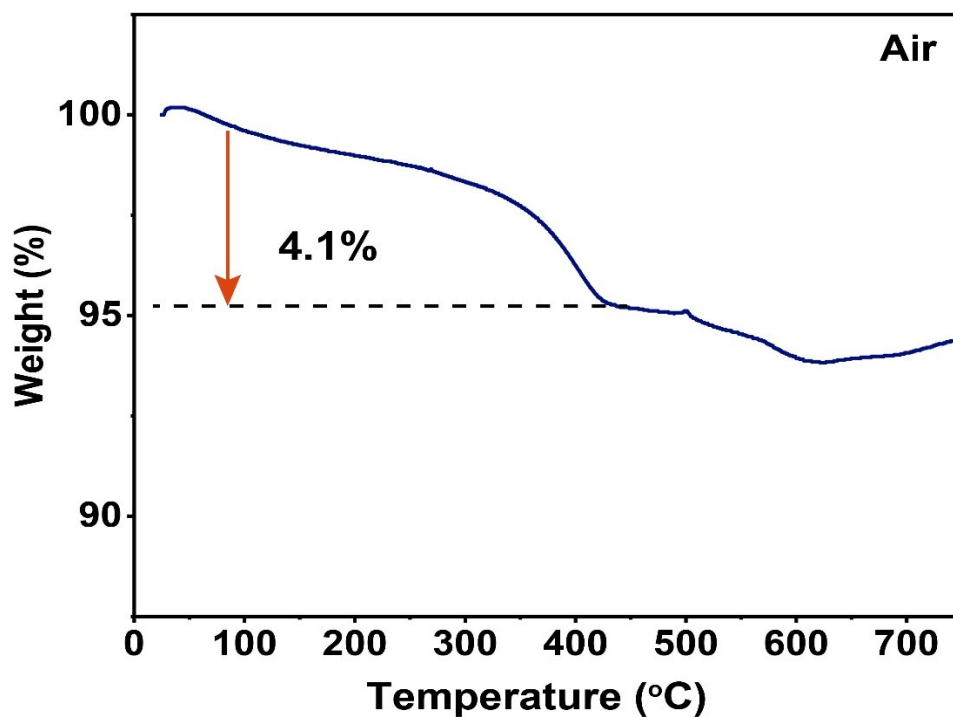
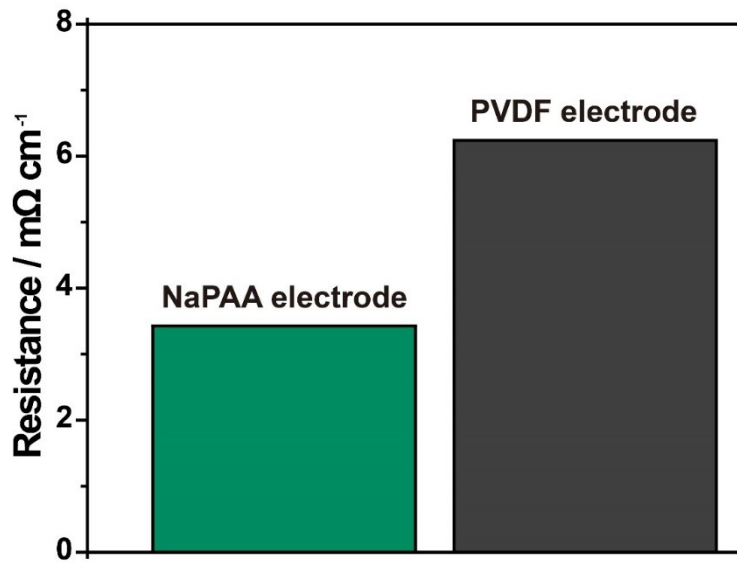
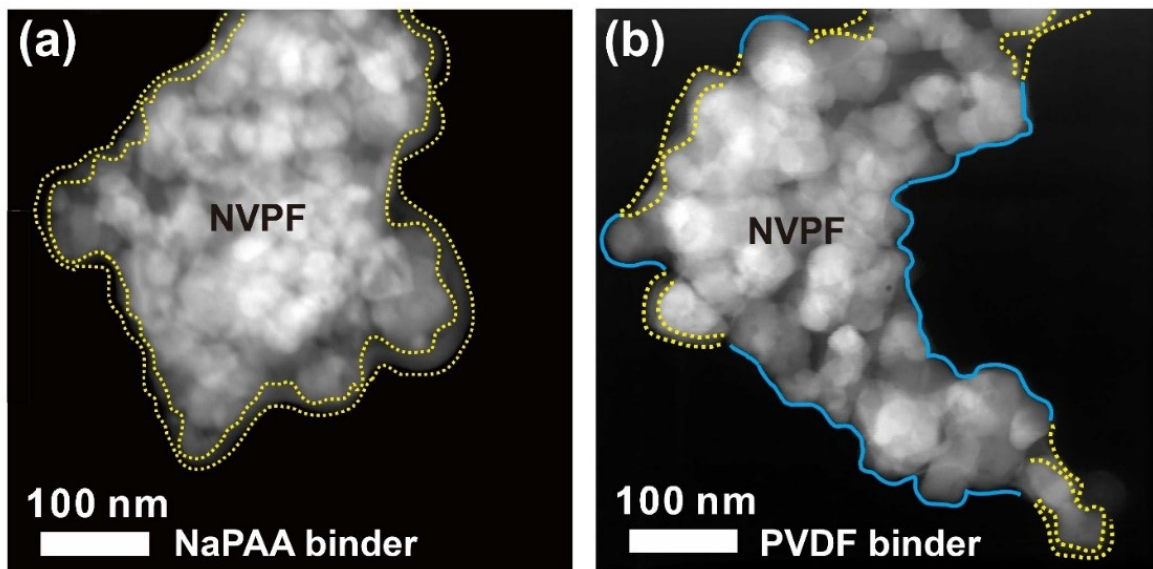


Fig. S2 Thermogravimetric analysis of NVPF under air at a heating rate of  $10^\circ\text{C min}^{-1}$ .



**Fig. S3** NaPAA and PVDF electrode resistances from four-point probe measurements.



**Fig. S4** TEM images of NVPF particles with (a) NaPAA or (b) PVDF binder. Binder coverage section is shown by the yellow dotted line, while non-coverage part is indicated by the sky-blue line.

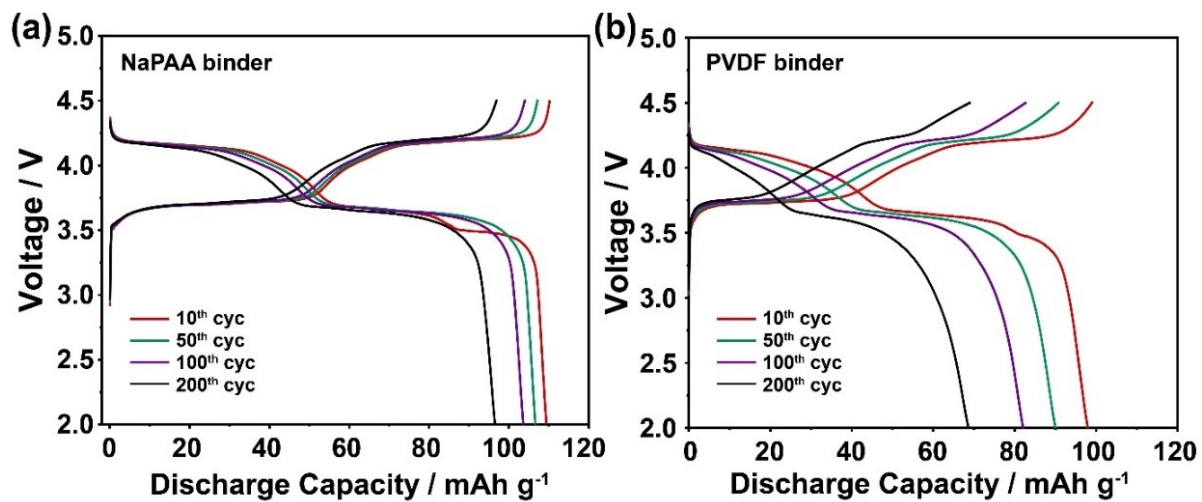


Fig. S5 Voltage profiles of (a) NaPAA and (b) PVDF electrodes at 10, 50, 100, and 200 cycles, at a rate of 1C.

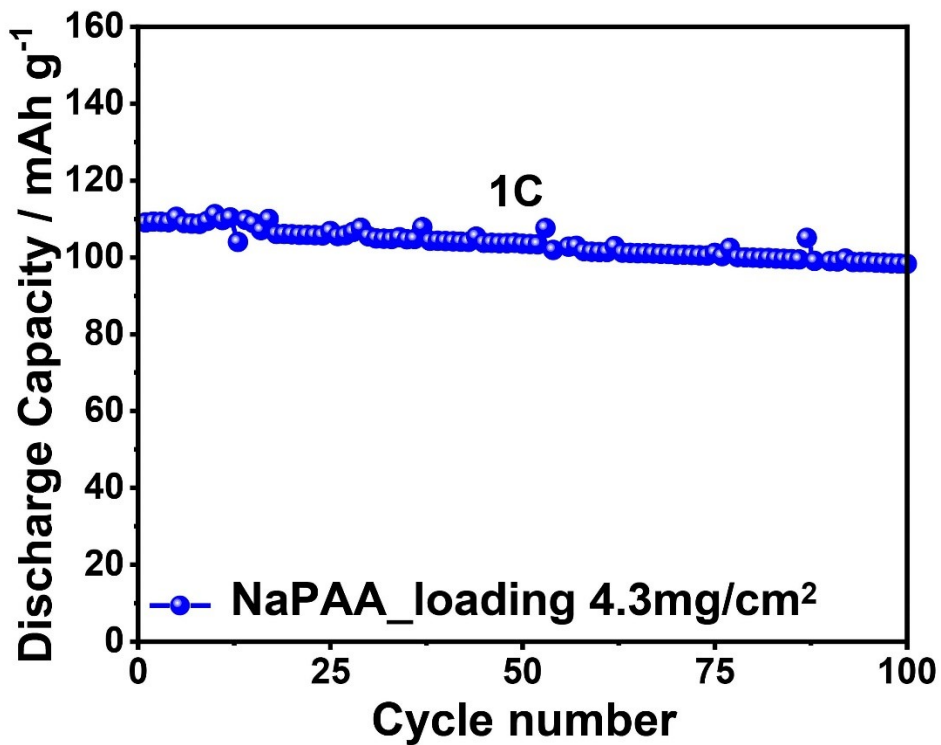


Fig. S6 Cycling performance of NVPF electrode with NaPAA binder at 4.3 mg cm<sup>-2</sup>.

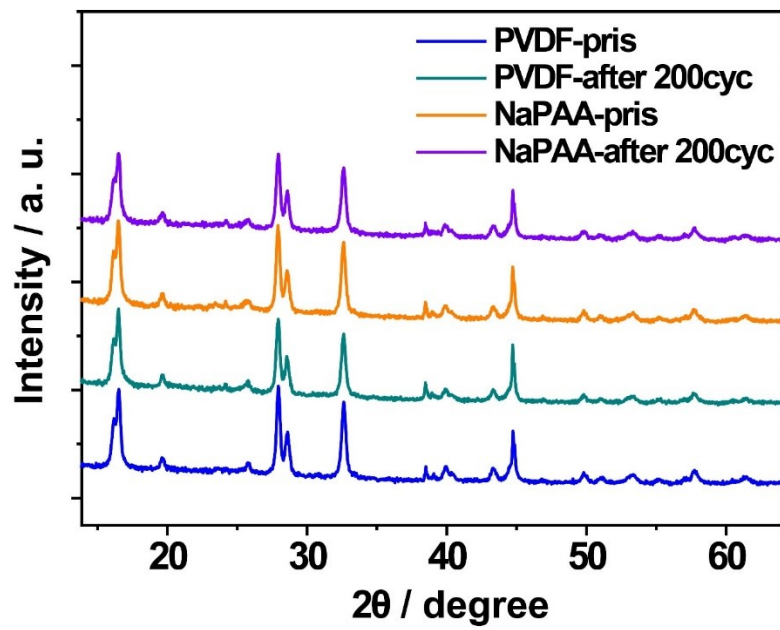


Fig. S7 XRD profiles of electrodes at pristine and after 200 cycles for NaPAA and PVDF binders.

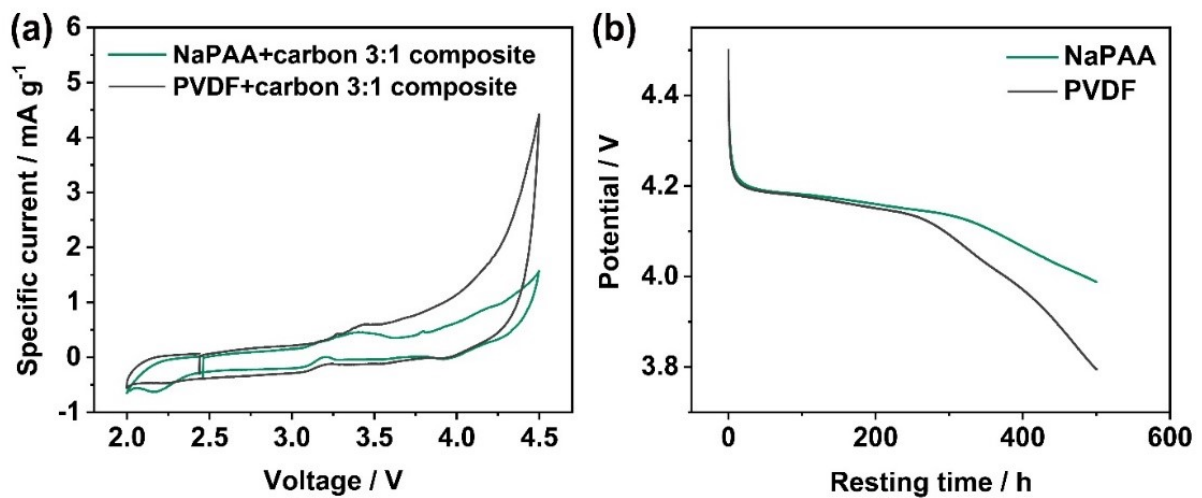
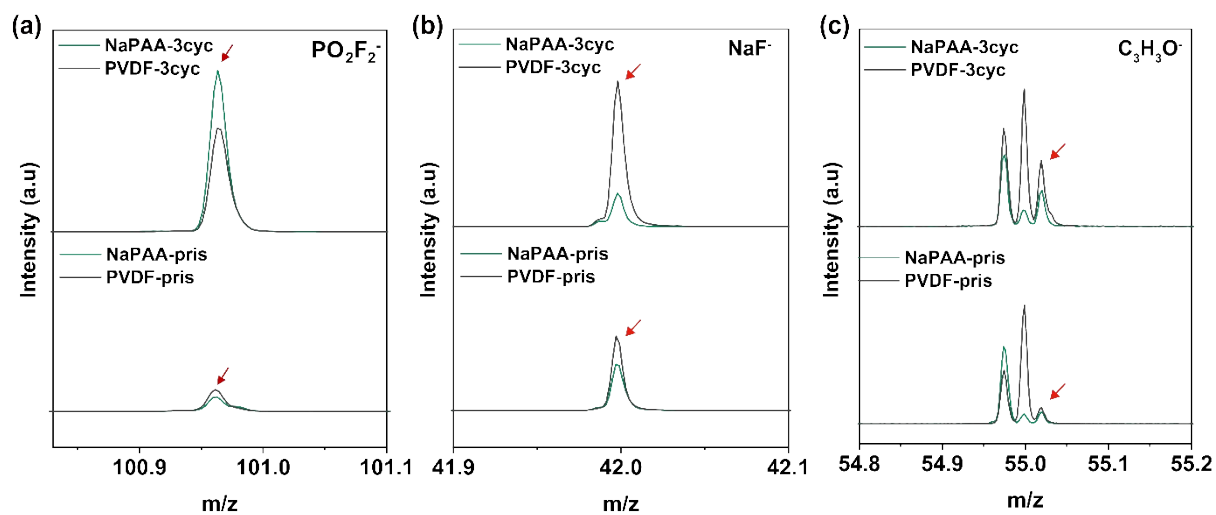


Fig. S8 (a) CV profiles of carbon electrodes with NaPAA and PVDF binders. (b) Self-discharge test result of voltage changes of NaPAA and PVDF electrodes at charged state.



**Fig. S9** ToF-SIMS profiles of (a)  $\text{PO}_2\text{F}_2^-$ , (b)  $\text{NaF}^-$ , and (c)  $\text{C}_3\text{H}_3\text{O}^-$  for NaPAA and PVDF electrodes at pristine and 3 cycles.