Supporting Information

Stability enhancing ionic liquid hybrid electrolyte for NVP@C cathode based sodium batteries

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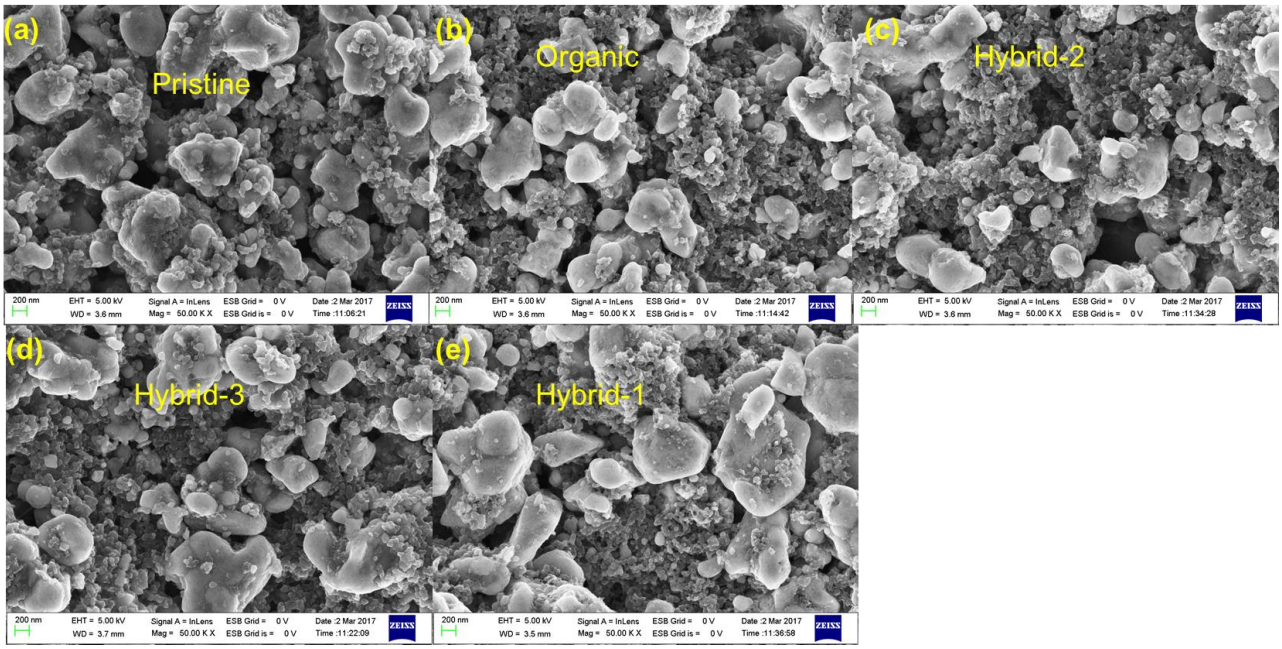


Figure S1: FEG-SEM images of NVP@C electrodes: pristine and after 100 cycles with organic and hybrid electrolytes.

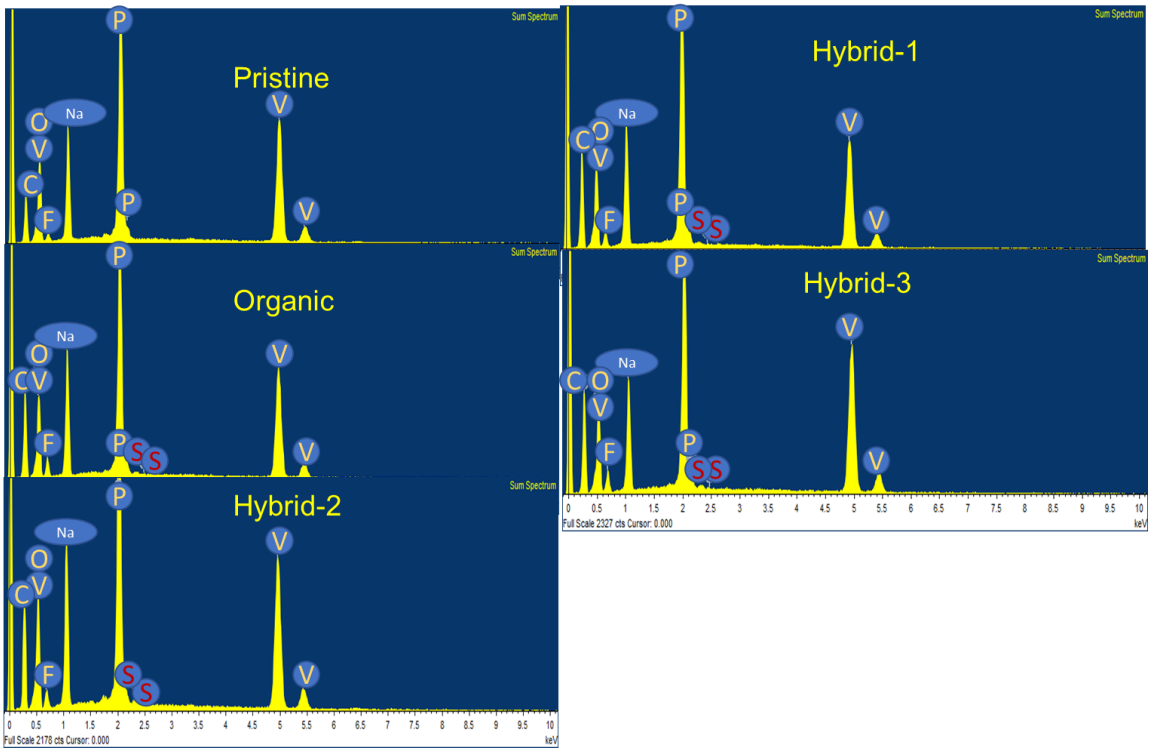


Figure S2: EDX analysis of NVP@C electrode cycled with organic and hybrid electrolytes.

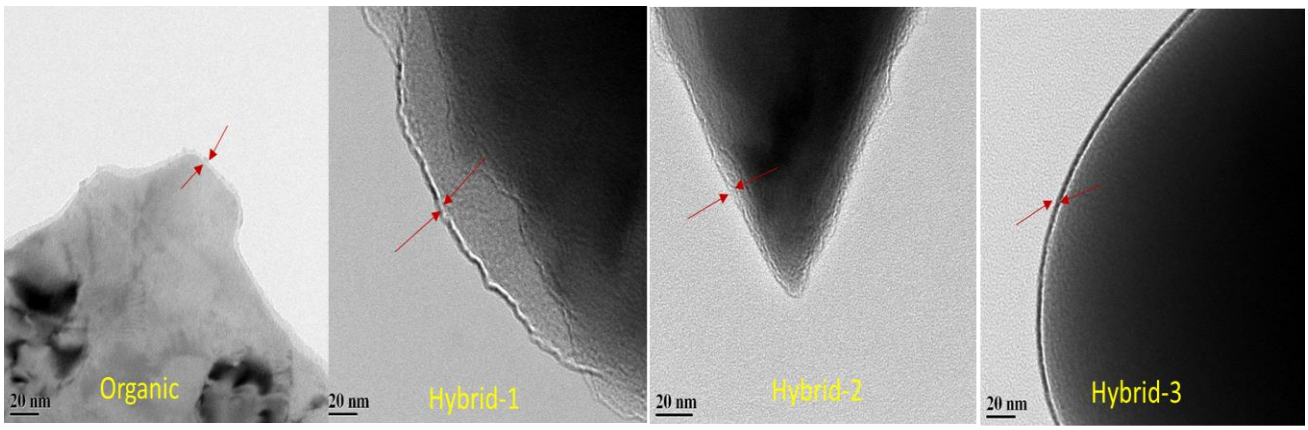


Figure S3: HR-TEM images of Passivation layer on the surface of NVP@C electrode after cycling with (a)Organic, (b) Hybrid-1, (c) Hybrid-2 and (d) Hybrid-3 electrolyte.

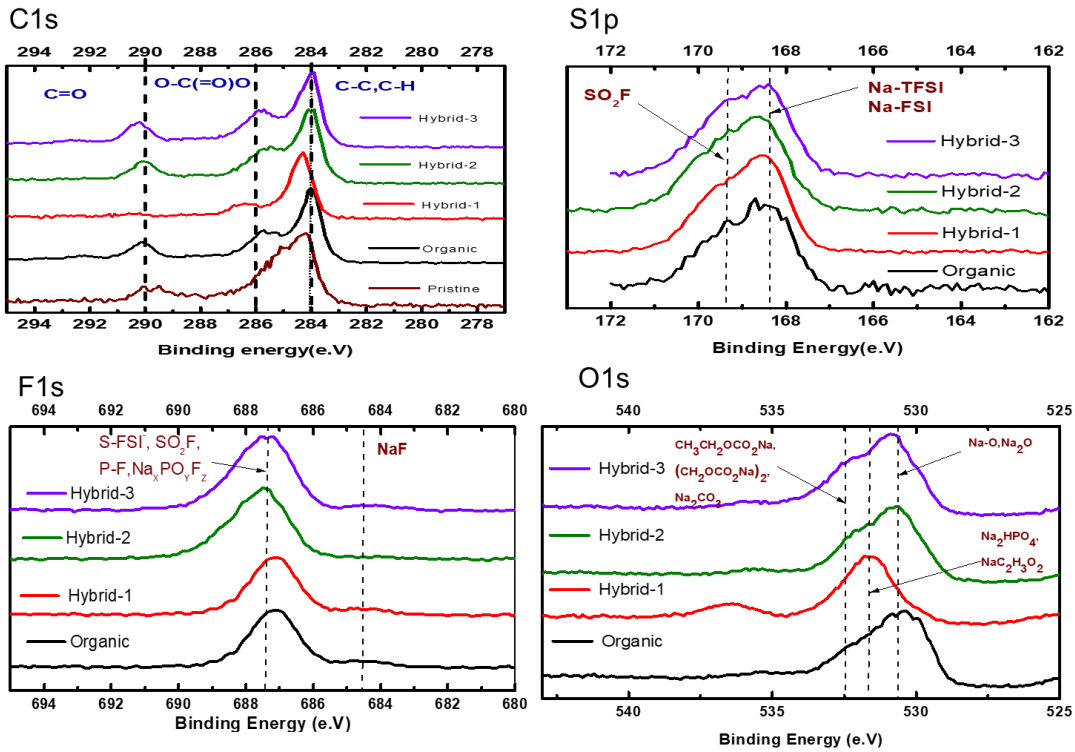
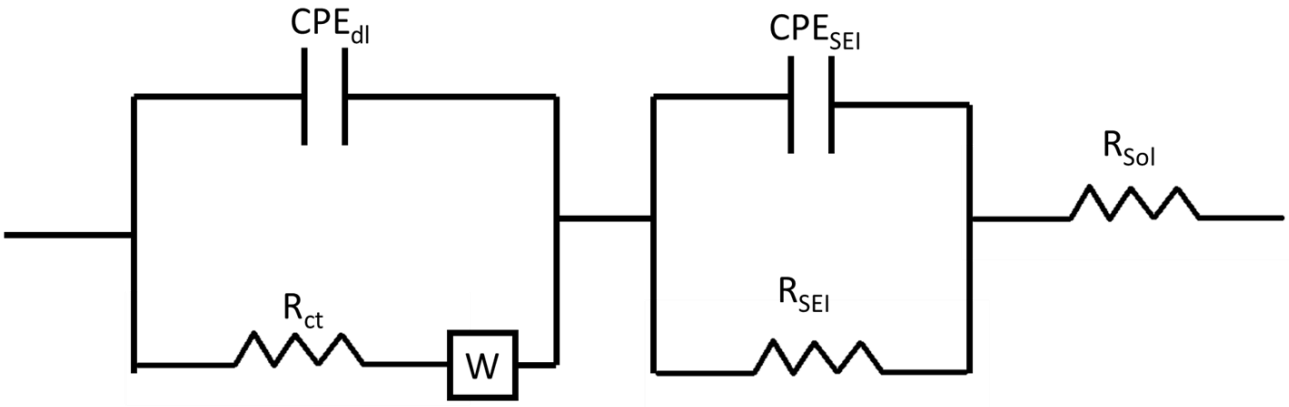


Figure S4: XPS spectrum of NVP@C cycled electrode with organic and hybrid electrolytes.

Table S1: RC Circuit and resistance values for hybrid electrolytes in sodium ion battery.



System	R_{SEI} (ohm)	R_{ct} (ohm)	R_{sol} (ohm)
Na|HE-2|Na (**Figure 7**)	144.9	823.4	14.4
Na|HE-3|Na (**Figure 7**)	129.3	689.7	14.8
NVP@C|HE-2|Na (**Figure 8**)	731.2	782.8	16.2
NVP@C|HE-3|Na (**Figure 8**)	607.6	731	16.7

-R_{SEI} -SEI resistance
-R_{ct} - Charge transfer resistance
-R_{sol} - Solution resistance
-HE- Hybrid electrolyte

Table S2: Different electrolyte composition in sodium and lithium ion batteries literature.

Cell system	Solvent	Salt	Electro chemical stability	Thermal stability	Reference
Hard carbon/Na	EC:PC(1:1) (wt%)+ 10 wt% C3mpyrTFSI	0.8M NaTFSI	<3.2V	<140°C	[1]
NVP/C||Na	EC: PC (50:50) wt%	1M $NaClO_4$	0.1-5V	~100°C	[2]
$Na[Ni_{0.25}Fe_{0.5}Mn_{0.25}]O_2$/C–$Fe_3O_4$	EMS+ 2 vol% FEC	1M $NaClO_4$	5.6V	~120°C	[3]
$Na_{0.7}CoO2$||Na	EC:DMC (30:70) wt%	0.5M $NaPF_6$	4.8V	~120°C	[4]
NVP@C||Na	EC:PC(1:1)v/v %:C3mpyrTFSI (50:50)v/v	1M NaFSI	0.01-5V	>180°C	Our work
LiFePO4||Li	EC:DEC(1:1)v/v%+38wt% C3mpyrTFSI	1M $LiPF_6$	4.8V	<90°C	[5]
LiCoO2||Li	EC:DMC(1:1) v/v%+ 40wt%C3mpyr TFSI	1M $LiPF_6$	4.8V	<90°C	[6]
LiFePO4/Li	PC: C4mpyrTFSI (1:1) wt%	0.3M LiTFSI	4.1V	<128°C	[7]

References:

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