Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Porous Carbon Adsorption Layer Enabling Highly Reversible Redox-Reaction of High Potential Organic Electrode Material for Sodium Ion Batteries

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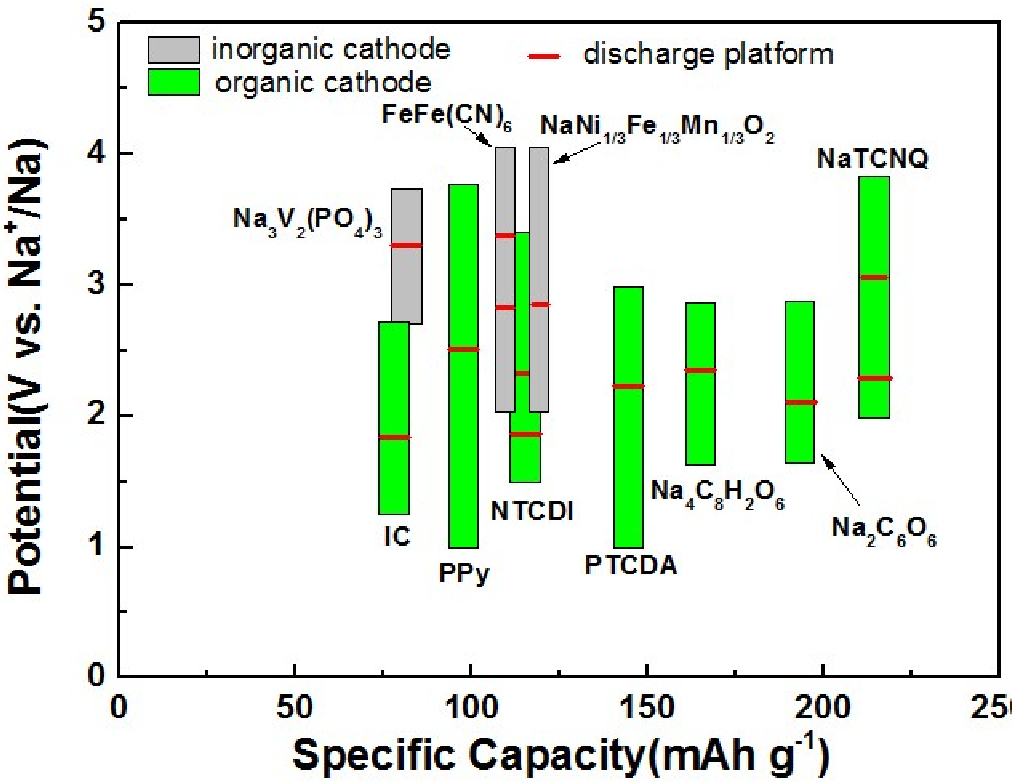

Fig S1. The electrochemical properties of some representative cathode materials, including operating voltage range and discharge platform(versus Na^+/Na) and specific capacity. ($NaNi_{1/3}Fe_{1/3}Mn_{1/3}O_2$ [7], $Na_3V(PO_4)_3$ [8], $FeFe(CN)_6$ [9], indigo carmine(IC) [10], polypyrrole(PPy) [11], 1,4,5,8-naphthalenetetracarboxylic diimide (NTCDI) [12], 3,4,9,10-perylene-tetracarboxylicacid-dianhydride (PTCDA) [13], tetrasodium salt of 2,5-dihydroxyterephthalic acid ($Na_4C_8H_2O_6$) [14], $Na_2C_6O_6$ [15])

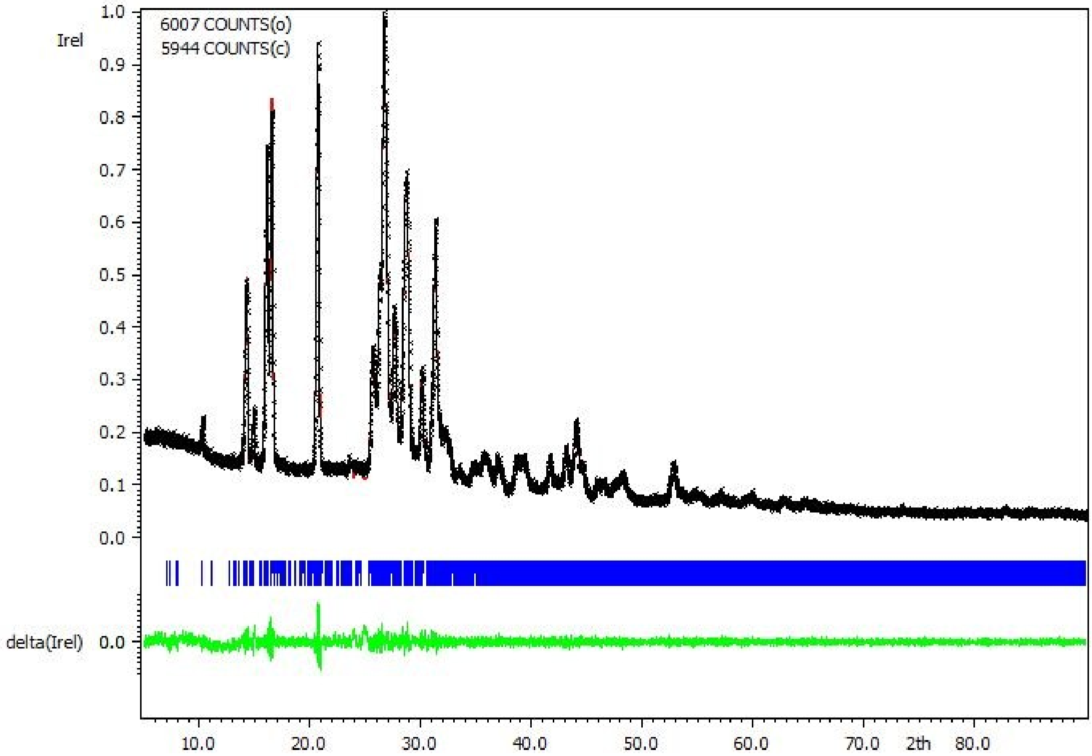

Fig. S2. The XRD profile Rietveld refinement of NaTCNQ powder.

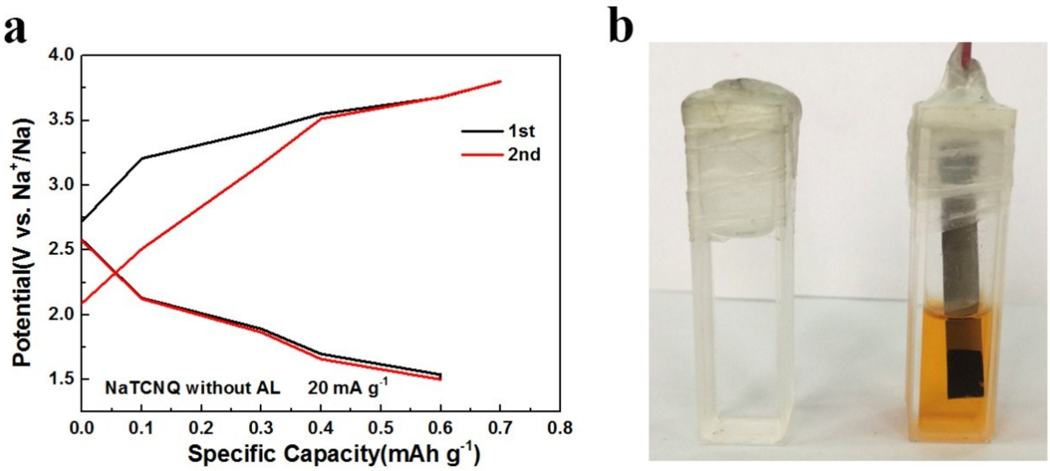

Fig. S3. (a) Charge discharge performance of NaTCNQ without AL at a current density of 20 mA g^{-1}. (b) The 1 M $NaClO_4$ in EC/PC (1:1 v:v) electrolyte (left) and the dissolution behavior of NaTCNQ electrode in it (right).

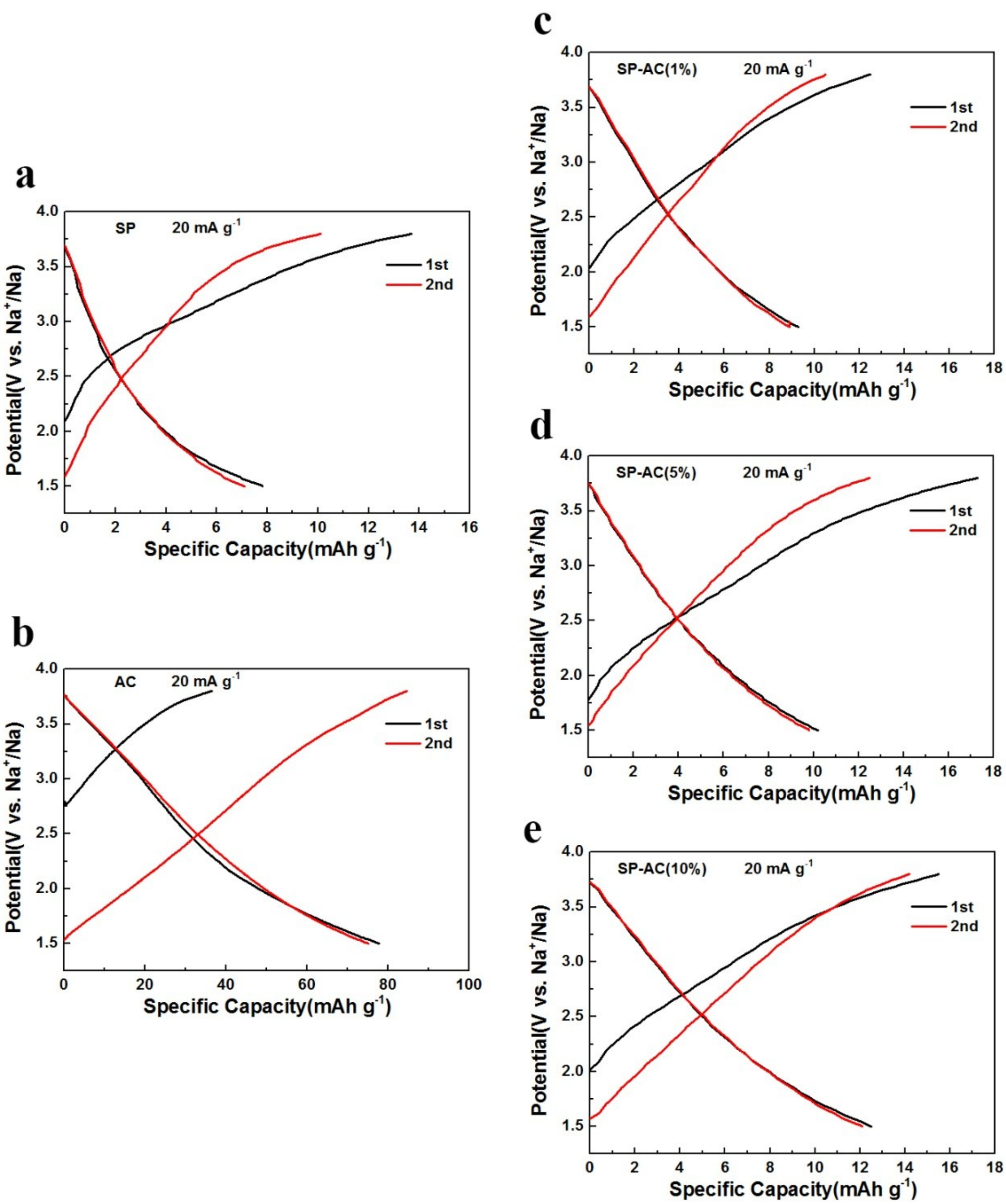

Fig. S4. Charge discharge performance of (a) SP (b) AC (c) SP-AC (1%) (d) SP-AC (5%) (e) SP-AC (10%) at a current density of 20 mA g^{-1}.

In the charge process

The first cycle

$NaTCNQ - e^- \rightarrow TCNQ^0 + Na^+$ (OCV - 3.8 V) (1)

After the first cycle

$[Na(TCNQ)^{2-}]^- - e^- \rightarrow NaTCNQ$ (1.5 - 3.0 V) (2)

$NaTCNQ - e^- \rightarrow TCNQ^0 + Na^+$ (3.0 - 3.8 V) (3)

In the discharge process

$TCNQ^0 + Na^+ + e^- \rightarrow NaTCNQ$ (3.8 - 3.0 V) (4)

$NaTCNQ + e^- \rightarrow [Na(TCNQ)^{2-}]^-$ (3.0 - 1.5 V) (5)

Scheme S1. Charge and discharge equations of NaTCNQ

Table S1. Specific surface area (SSA), and most probable pore diameter (MPPD) of SP, SP-AC (5%), SP-AC (10%) and AC by fitting calculation.

Carbon	SSA/m^2 g^{-1}	MPPD/nm
SP	75	2.56
SP-AC (1%)	97	2.42
SP-AC (5%)	122	2.43
SP-AC (10%)	196	1.82
AC	1592	1.71

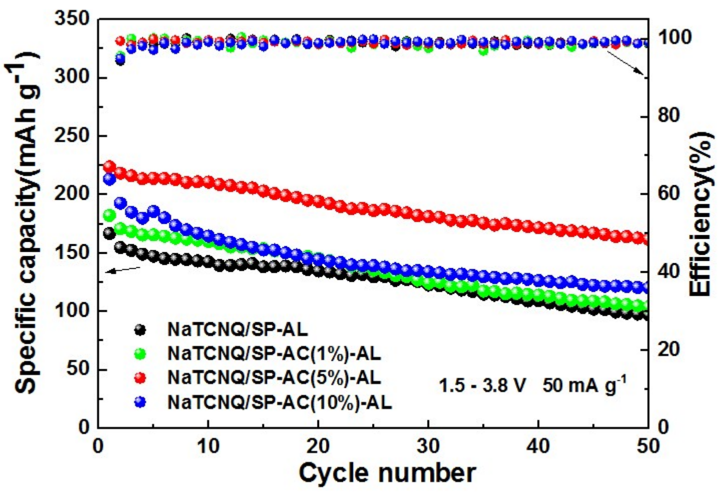

Fig. S5. Cycling performance of NaTCNQ/SP-AL, NaTCNQ/SP-AC (1%)-AL, NaTCNQ/SP-AC (5%)-AL and NaTCNQ/SP-AC (10%)-AL electrodes in the voltage range of 1.5-3.8 V (vs. Na^+/Na) at 50 mA g^{-1} (repeatable data).