Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information

Highly Reversible Na-ion Storage in N-doped polyhedral Carbon-Coated Transition-metal chalcogenides by Optimizing Nanostructure and Surface Engineering

Yuelei Pan[a], Xudong Cheng[a*], Lunlun Gong[a], Long Shi[b], Yurui Deng[a], Heping Zhang[a*]

a State Key Laboratory of Fire Science, University of Science and Technology of China, Hefei, Anhui 230027, PR China

b Civil and Infrastructure Engineering Discipline, School of Engineering, RMIT University, Melbourne, VIC 3001, Australia

The file includes Figure S1-S7 and Table S1.

Corresponding author.
* (X.C.) E-mail address: chengxd@ustc.edu.cn
* (H.Z.) E-mail address: zhanghp@ustc.edu.cn

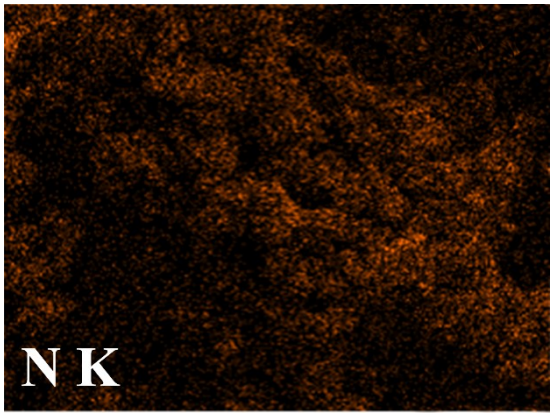

Fig. S1 EDX elemental mapping of N.

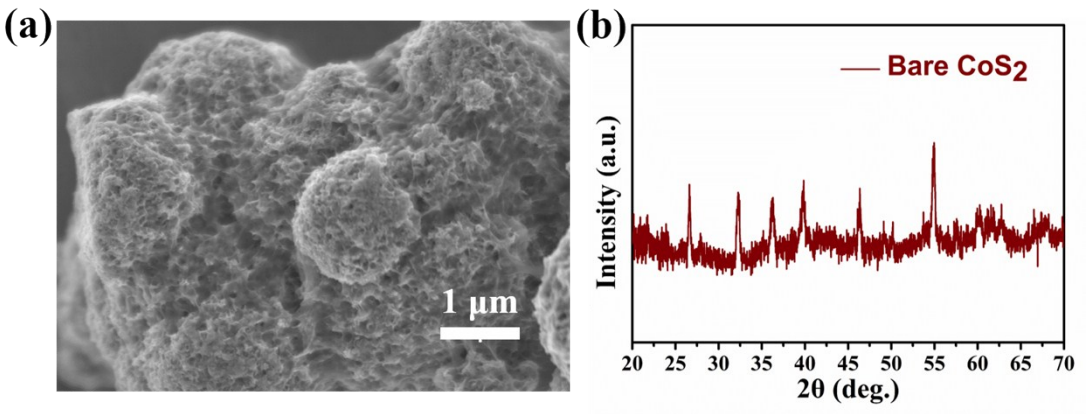

Fig. S2 SEM image (a) and XRD patterns (b) of bare CoS_2.

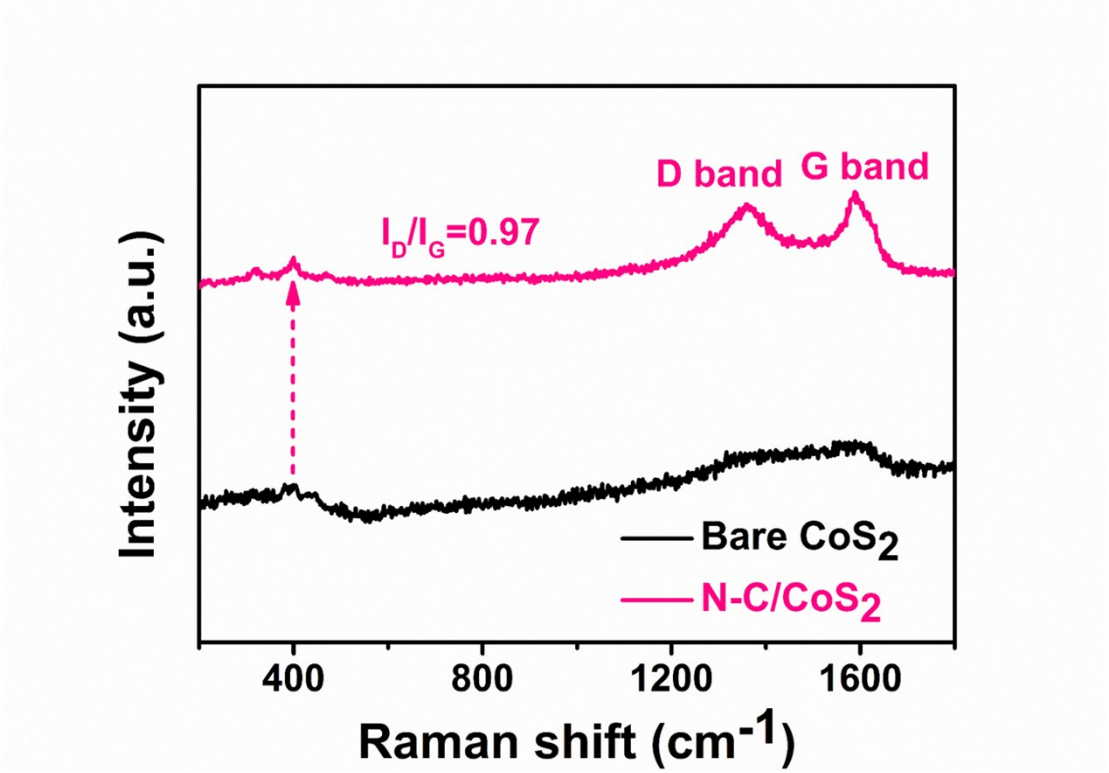

Fig. S3 Raman spectra of bare CoS_2 and N-CoS_2@C.

Table S1 Carbon, sulfur, nitrogen and cobalt atomic contents from XPS.

Name	Start BE	Peak BE	End BE	FWHM eV	Atomic %
S2p	172.08	163.23	157.08	3.2	21.76
Co2p	788.08	778.96	761.08	3.19	42.64
C1s	293.08	285.14	281.08	3.05	20.97
N1s	405.08	399.38	396.08	3.54	14.63

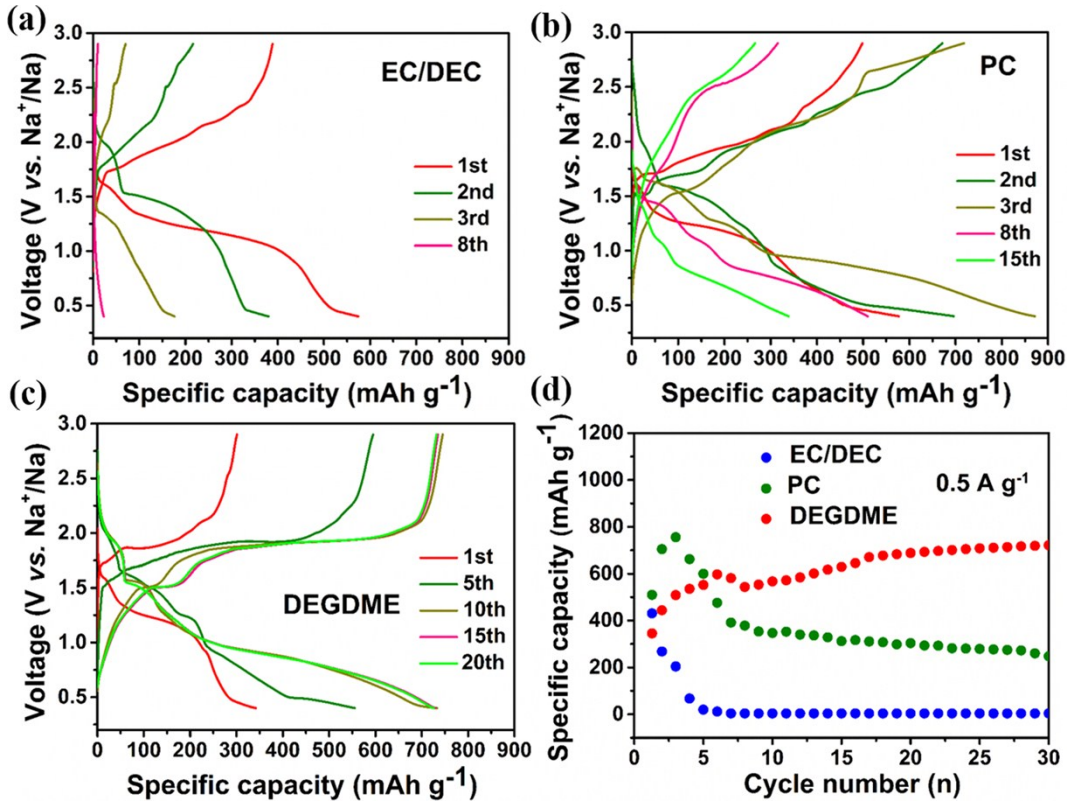

Fig. S4 Charge-discharge curves of N-CoS_2@C electrodes using 1 M $NaCF_3SO_3$ in (a) EC/DEC, (b) PC, (c) DEGDME at 0.5 A g^{-1} in potential range of 0.4-2.9 V and (d) cycling performance in the three different solvents.

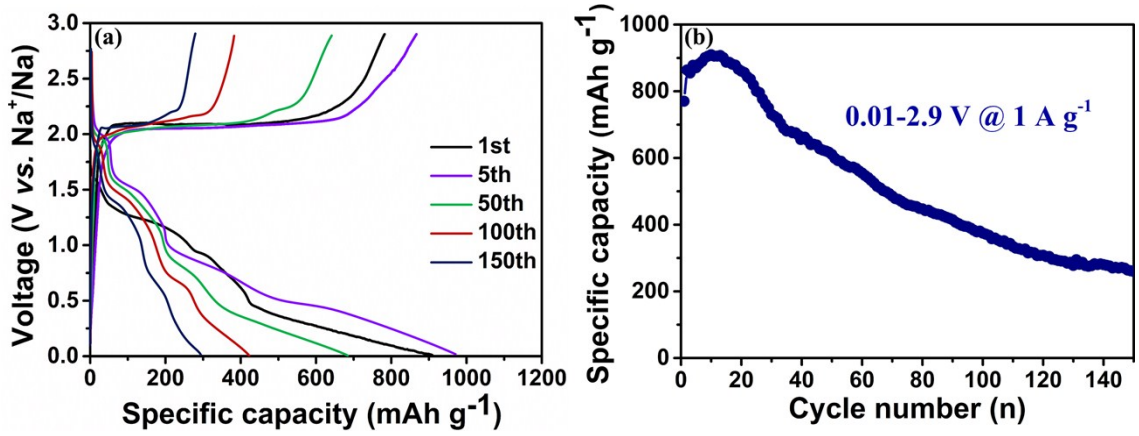

Fig. S5 (a) Charge-discharge curves and (b) long-cycling performance of N- CoS_2@C electrodes with a voltage ranging 0.01 V to 2.9 V.

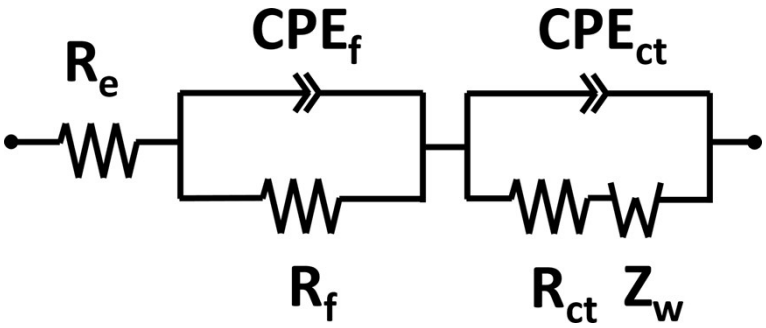

Fig. S6 The fitted plot of electrochemical impedance spectra by Randles equivalent circuit.

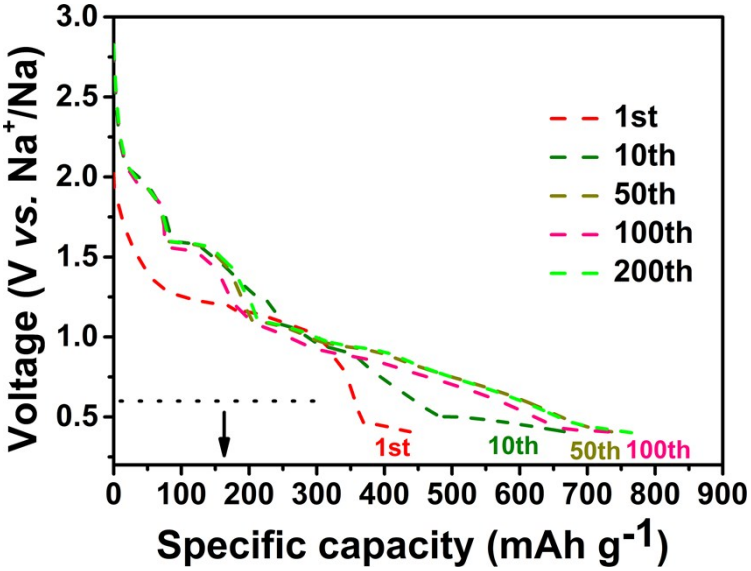

Fig. S7 Discharge profiles of N-CoS_2@C electrode at 1st, 10th, 50th, 100th and 200th.

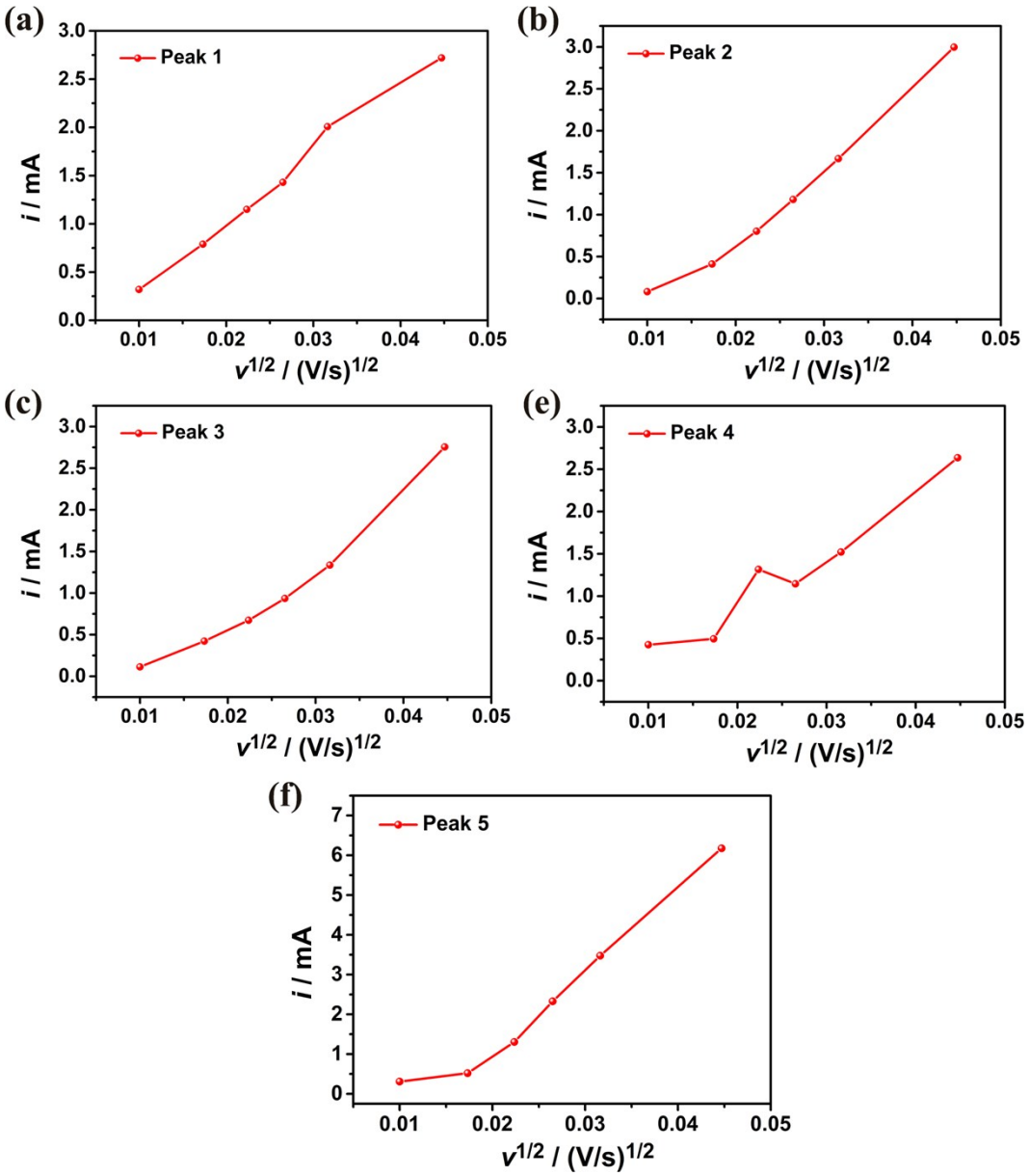

Fig. S8 *i* vs. $v^{1/2}$ plots at each redox peak of CV curves (peak current *i*, scan *v*).

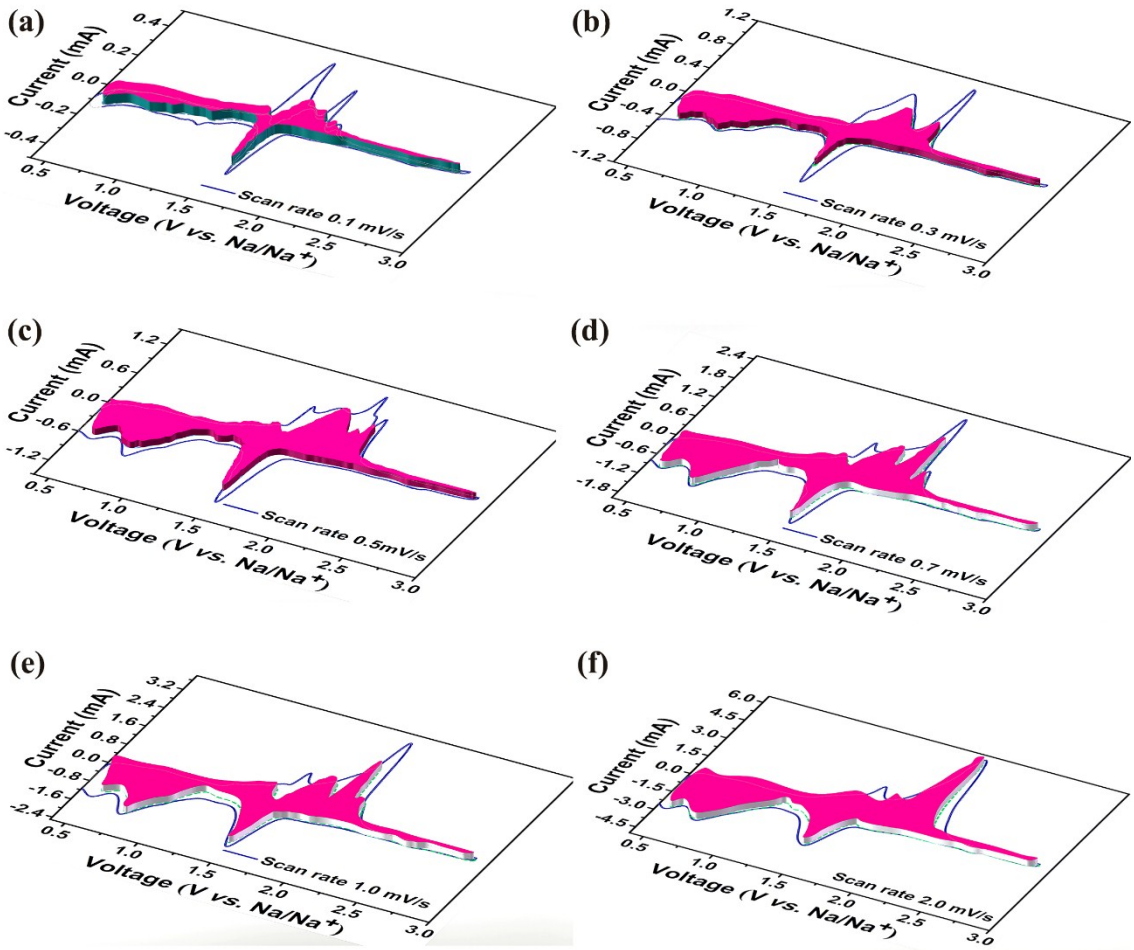

Fig. S9 CV curve with the pseudocapacitive fraction shown by the red region at various scan rates.

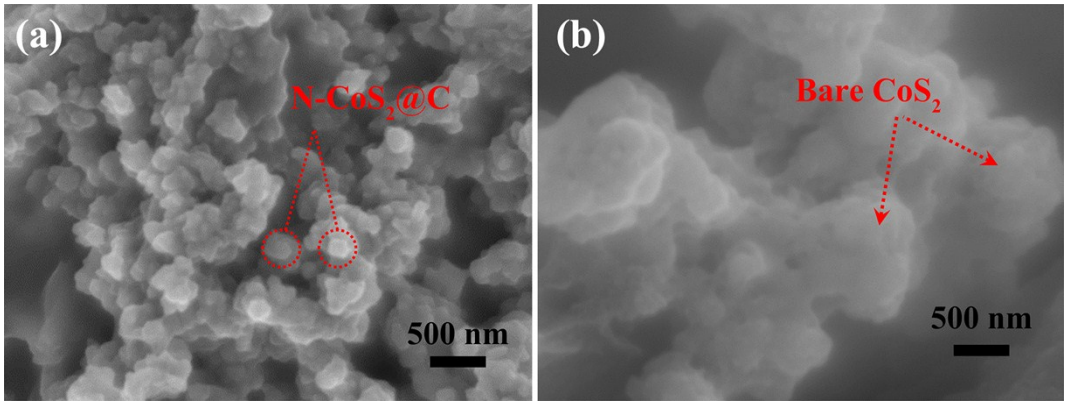

Fig. S10 SEM images of (a) N- CoS_2@C electrode and (b) bare CoS_2 electrode after 100 cycles at a current density of 1 A g^{-1}.

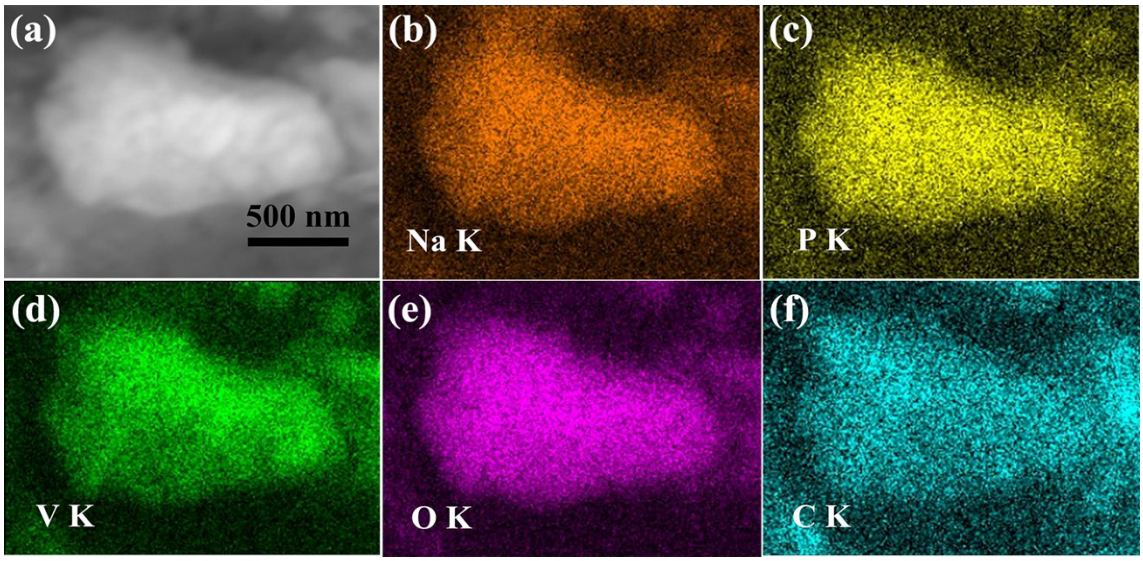

Fig. S11 EDS elemental mapping of NVP@C composites.

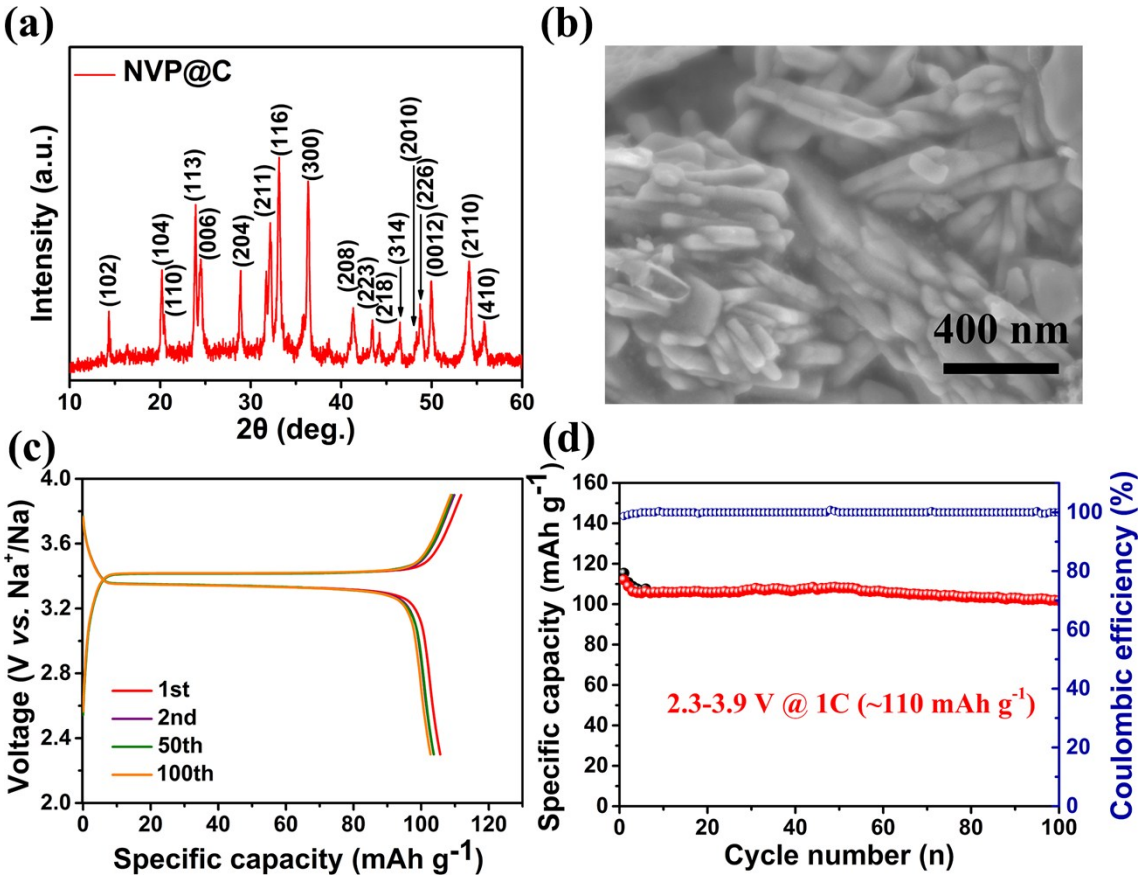

Fig. S12 (a) XRD pattern, (b) SEM image of NVP@C; (c) charge/discharge curves and (b) cycling performance of NVP@C electrode at a current density of 1 C.