Supporting Information for

A self-template approach to synthesize multicore-shell Bi@N-doped carbon nanosheets with interior void space for high-rate and ultrastable potassium storage

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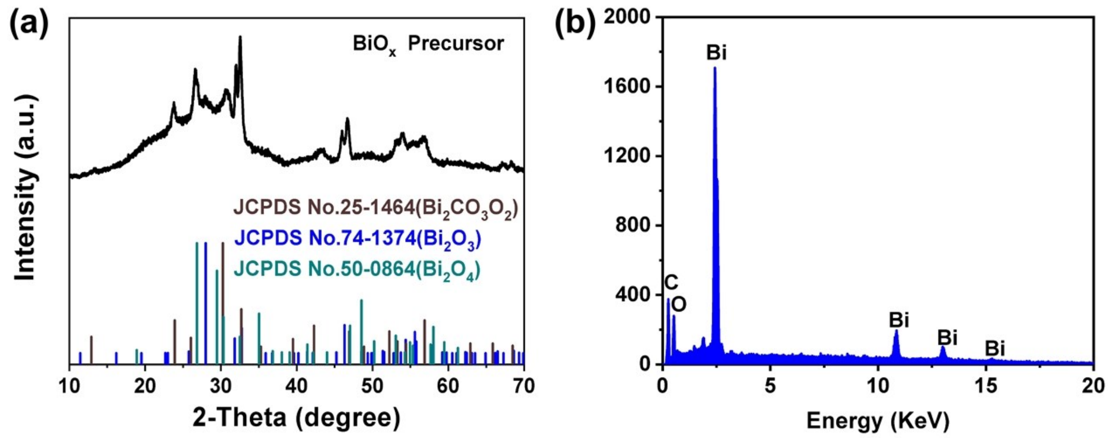

Fig. S1 (a) XRD patterns and (b) energy dispersive X-ray spectroscopy of the BiO$_x$ precursor.

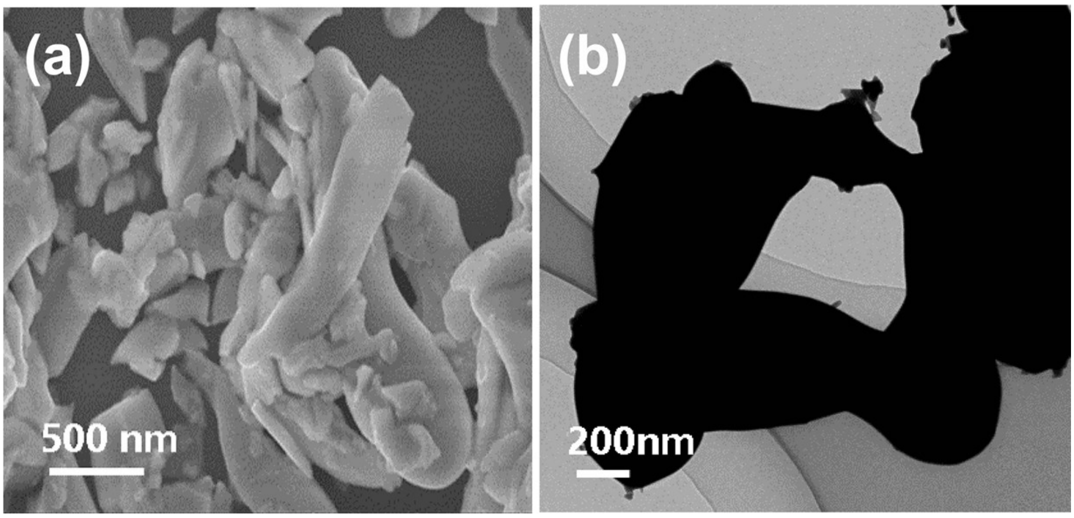

Fig. S2 SEM (a) and TEM (b) images of Bi particles through direct calcination treatment of BiOx precursor under Ar/H_2 atmosphere reduction treatment.

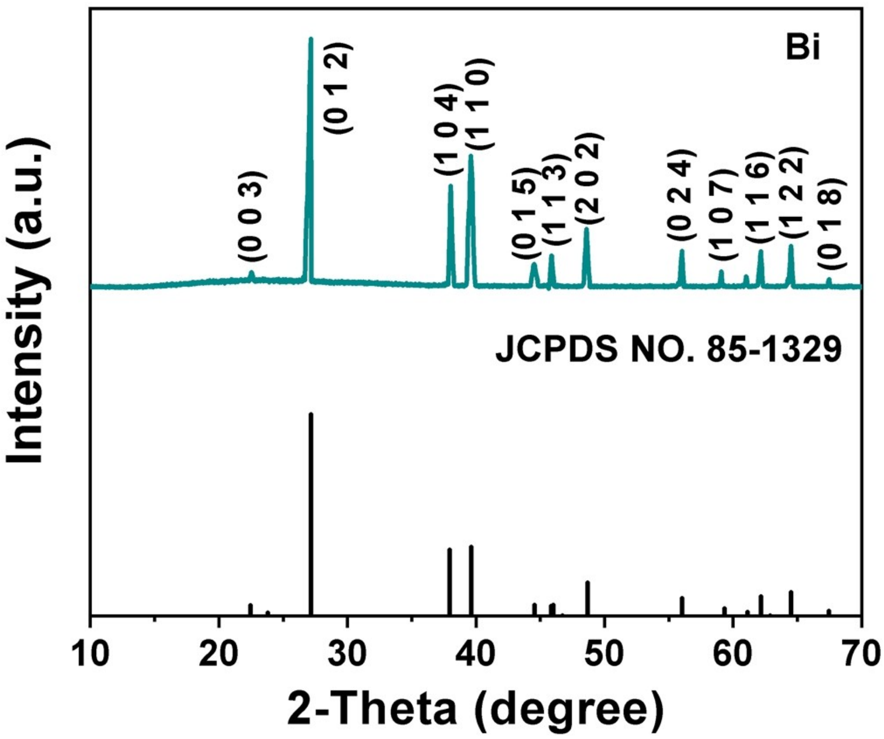

Fig. S3 XRD patterns of the pure Bi.

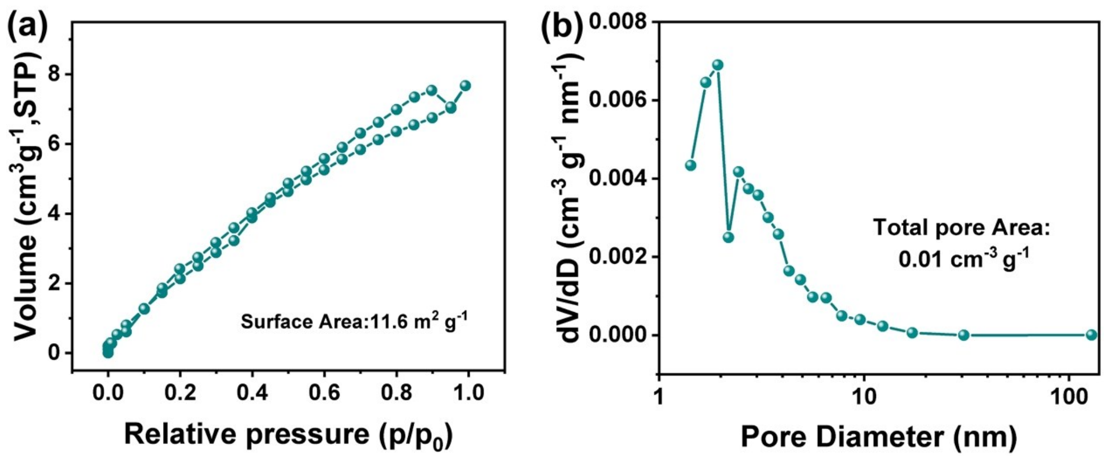

Fig. S4 (a) Nitrogen adsorption-desorption isotherms and (b) pore size distribution curves of pure Bi.

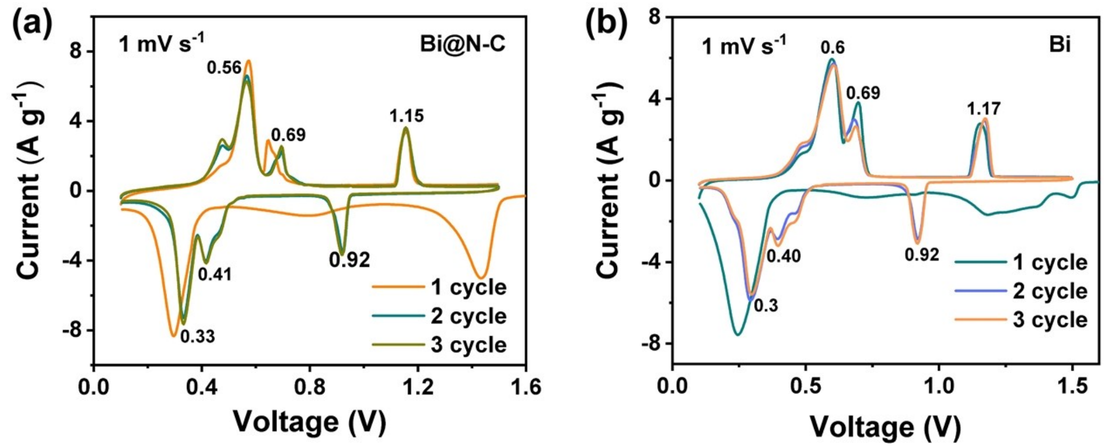

Fig. S5 CV curves of (a) Bi@N-C and (b) Bi electrodes at a scan rate of 1 mV s^{-1}.

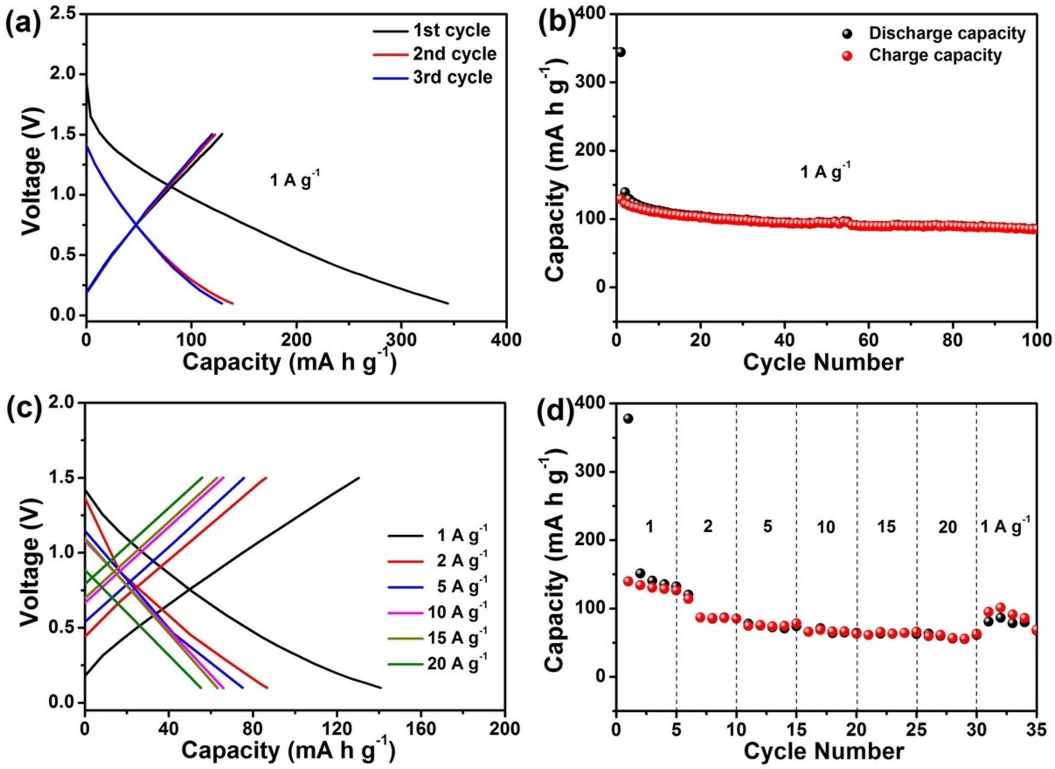

Fig.S6 potassium storage performance of N-doped carbon. (a) Discharge and charge profiles at 1 A g^{-1} for the initial three cycles, (b) cycling performance at 1 A g^{-1}, (c) typical discharge/charge curves under various rates, and (d) rate capabilities of N-doped carbon from 1 to 20 A g^{-1}.

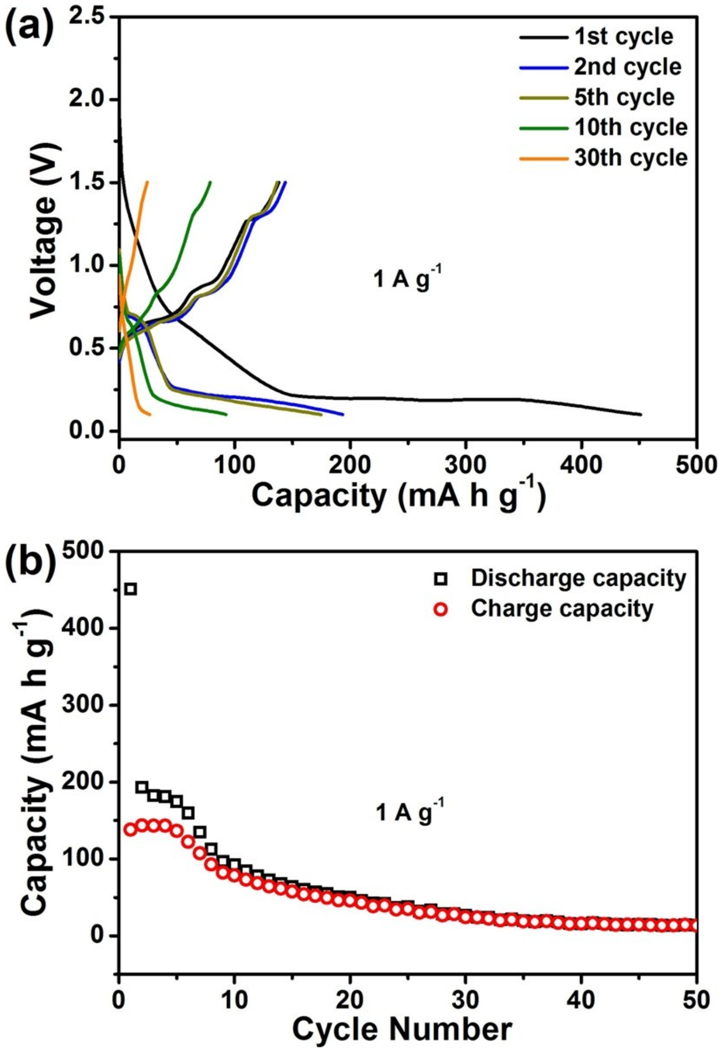

Fig. S7 (a) Discharge/charge profiles, and (b) cycling stability of Bi@N-C electrode for KFP_6 in EC/PC electrolyte.

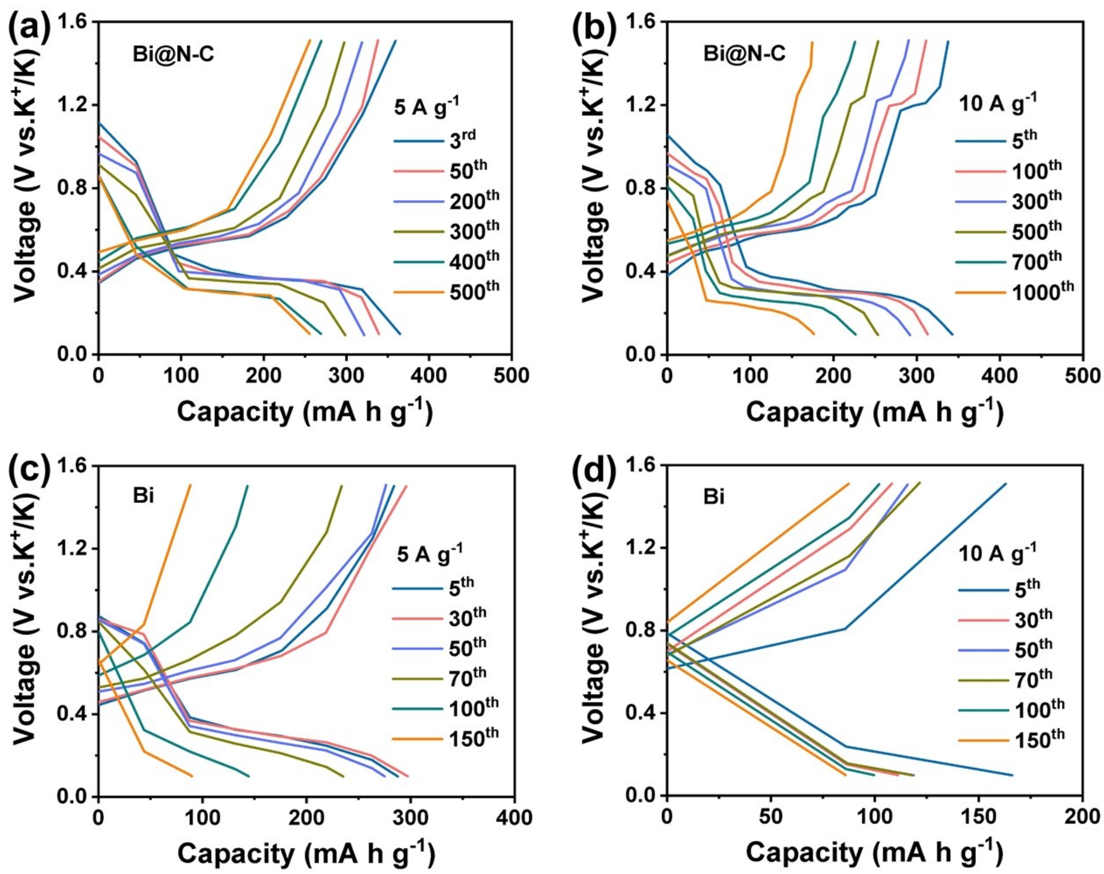

Fig. S8 Typical discharge/charge curves for selected cycles of (a-b) Bi@N-C and (c-d) Bi electrodes at current densities of (a, c) 5 A g^{-1} and (b, d) 10 A g^{-1}.

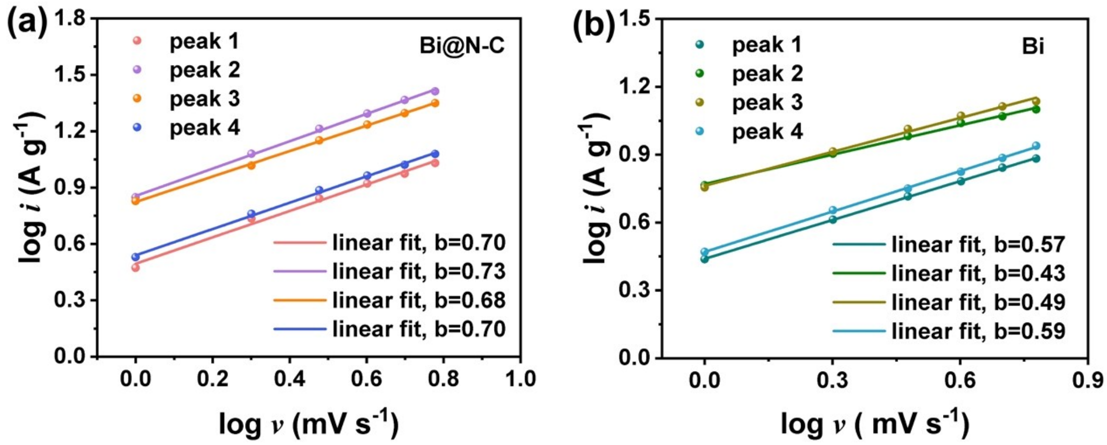

Fig. S9 Log (i) versus log (v) plots at different oxidation and reduction states of (a) Bi@N-C and (b) Bi electrode.

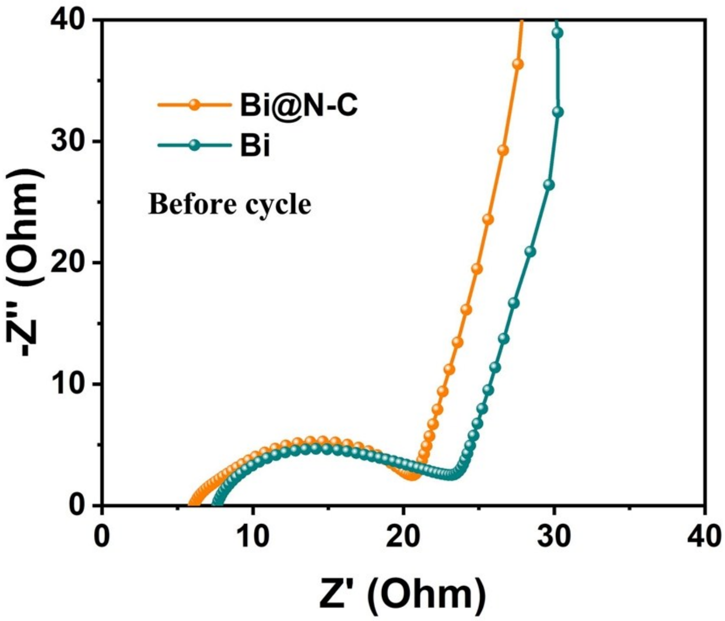

Fig. S10 EIS profiles of Bi@N-C and Bi electrodes before cycle.

Table S1. Electrochemical performance of alloy-based anodes for PIBs.

Anode	Current density (A g^{-1})	Cycle Number	Capacity (mA h g^{-1})	Rate (mA h g^{-1}/ A g^{-1})	References
Bi	0.4	100	392	-	*Adv. Energy Mater.*, **2018**, *8*, 1703496
Bi	0.08	50	200	-	*J. Phys. Chem. C*, **2018**, *122*, 18266
Bi	0.8	300	322	320/2	*Angew. Chem. Int. Ed.*, **2018**, *57*, 4687
Bi@C	0.1	35	151	-	*Chem. Sci.*, **2018**, *9*, 6193
Bi/rGO	0.05	200	~100	235/0.5	*Adv. Energy Mater.*, **2018**, *8*, 1703288
Bi/G	0.5	50	240	200/10	*Small*, **2019**, 1905789
Bi@N-C	1	100	268	152/100	*Adv. Funct. Mater.*, **2019**, *29*, 1809195
Bi@3DGFs	1	400	164	113/10	*J. Mater. Chem. A*, **2019**, *7*, 4913
C@Bi	0.4	200	200	222/0.8	*Matter*, **2019**, *1*, 1427
Sb@CNFs	0.2	100	330	145/5	*Angew. Chem. Int. Ed.*, **2019**, *58*, 14578
Sb@C	0.2	504	200	530/0.2	*Energy Environ. Sci.*, **2019**, *12*, 615
Sb@MOF	0.1	100	497	270/1	*Chem. Commun.*, **2019**, *55*, 12511
Sb@3DC	0.2	150	445	286/1	*J. Mater. Chem. A*, **2019**, *7*, 9629
Sb_2Se_3@C	0.5	400	191	174/2	*J. Mater. Chem. A*, **2019**, *7*, 12283
3DC/Sn	0.05	100	276	150/0.5	*J. Mater. Chem. A*, **2018**, *6*, 434
SnS_2–RGO	0.5	150	311	163/1	*J. Mater. Chem. A*, 2019, *7*, 19332
SnS_2@C	1	1000	274	397/2	*ChemSusChem*, **2019**, *12*, 2689
Sn_4P_3@C	0.5	1000	160	170/2	*Joule*, **2018**, *2*, 1534
Sn_4P_3@C	0.5	800	181.5	184/2	*Energy Storage Mater.*, **2019**, *23*, 367
SnSb@NC	0.5	200	186	117/2	*J. Mater. Chem. A*, **2019**, *7*, 14309
RP/C	1	60	300	71/3	*Adv. Sci.*, **2019**, *6*, 1801354
$(Bi,Sb)_2S_3$	0.5	1000	353	300/1	*ACS Nano*, **2019**, *13*, 3703
(Bi,Sb)@C	0.5	400	226	200/2	*J. Mater. Chem. A*, **2019**, *7*, 27041
Bi@N-C	**1**	**100**	**356**	**320/10**	**This work**
	5	**500**	**256**	**266/20**	
	10	**1000**	**180**	**175/30**	