Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C. This journal is © The Royal Society of Chemistry 2024

Supporting information

Introducing zinc ion into manganese-based Prussian blue for improving the structural stability of sodium-ion battery cathode

Hongyu Cheng,^a Yinping Qin,^a Yi-Nuo Liu,^a Zhuo-Er Yu,^a Ruyi Li,^a Riming Chen,^a

Jingjing Zhou,^a Yang Liu,^{*abc} and Bingkun Guo^{*a}

- Materials Genome Institute, Shanghai University, Shanghai, 99 Shangda Road, Baoshan
 District, Shanghai, China.
- Key Laboratory of Advanced Energy Materials Chemistry (Ministry of Education), Nankai University, Tianjin 300071, China.
- c. Key Laboratory of Optoelectronic Chemical Materials and Devices of Ministry of Education, Jianghan University, No. 8, Sanjiaohu Rd., Wuhan, Hubei, 430056, P. R. China.

Corresponding Author

Yang Liu, email: liuyang81@shu.edu.cn

Bingkun Guo, email: guobingkun@shu.edu.cn

[†]These authors contributed equally to this paper.

Samples	Elemental contents (wt%)			
	Na	Mn	Fe	Zn
MF-N	28.32	35.10	34.78	_
MF-NZ	27.50	36.22	36.08	3.45

Table S1. ICP element ratio of MF-N and MF-NZ.

Table S2. EIS fitting results of MF-N and MF-NZ.

Samples	$R_{ct}\left(\Omega ight)$	
MF-N	343.5	Initial
	158.2	After 100 cycles
MF-NZ	214.2	Initial
	134.1	After 100 cycles



Fig. S1 Rietveld refinement results of MF-N (a) and MF-NZ (b).



Fig. S2 Particle size distribution of MF-N and MF-NZ.



Fig. S3 N₂ adsorption-desorption isotherms of (a) MF-N, (b) MF-NZ.



Fig. S4 (a) SEM and Elemental mapping images of cross-sectional MF-NZ particles; (b) XPS depth profiles of Zn 2p peaks of MF-NZ with increasing of Ar⁺ etching depth up to 300 nm.



Fig. S5 Raman spectra of MF-N, MF-NZ, and ZF-N.



Fig. S6 TGA curves of MF-N and MF-NZ samples.



Fig. S7 (a) Fe 2p and (b) Mn 2p XPS spectra of MF-N.



Fig. S8 (a) The initial charge-discharge curves for MF-N and MF-NZ at 0.1C; (b)

Charge/discharge curves of MF-NZ in the first 3 cycles at 0.1C; (c) Cycling performance of MF-N and MF-NZ at 0.1C.



Fig. S9 dQ/dV curves of (a) MF-N and (b) MF-NZ in the first cycle.



Fig. S10 (a) dQ/dV curves of ZF-N; (b) The initial charge-discharge curves of ZF-N at 0.1C.



Fig. S11 The charge-discharge curves of MF-N at different rates.



Fig. S12 XPS spectra of Zn 2p of MF-NZ cathodes obtained under different charging and discharging states after 100 cycles.



Fig. S13 Structure and electrochemical properties of MF-NZ stored at room temperature for 1.5 years: (a) XRD pattern; (b) SEM image; (c) TGA curve; (d) Rate performance at different rates; (e) Cycling performance at 1C.