

Supporting information

Hierarchical mesoporous octahedral $K_2Mn_{1-x}Co_xFe(CN)_6$ as a superior cathode material for sodium-ion batteries

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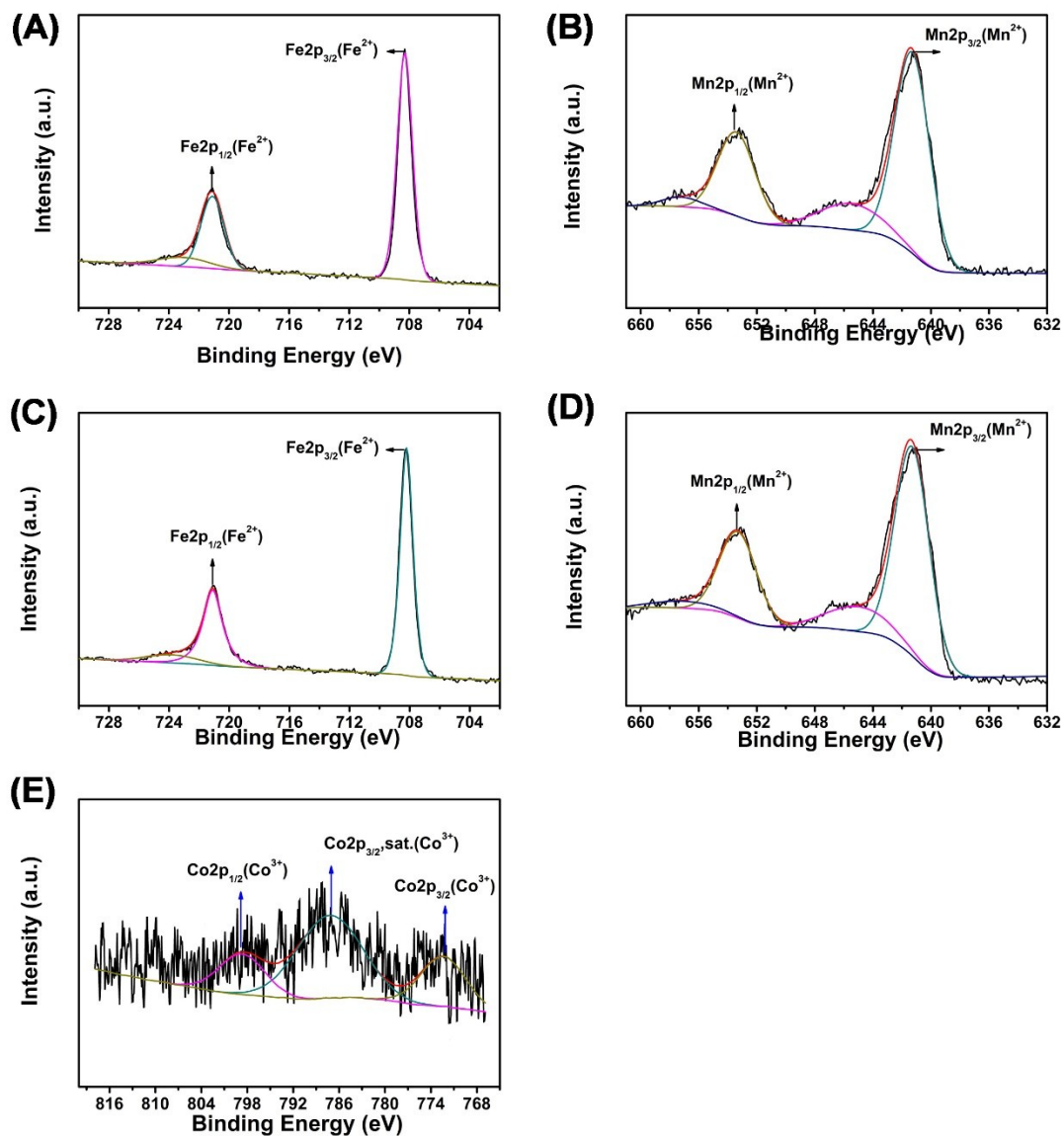


Fig. S1 XPS spectra of (A) Fe2p and (B) Mn2p of KMCHFC ($x=0$); (C) Fe2p, (D) Mn2p and (E) Co2p of KMCHFC ($x=0.1$).

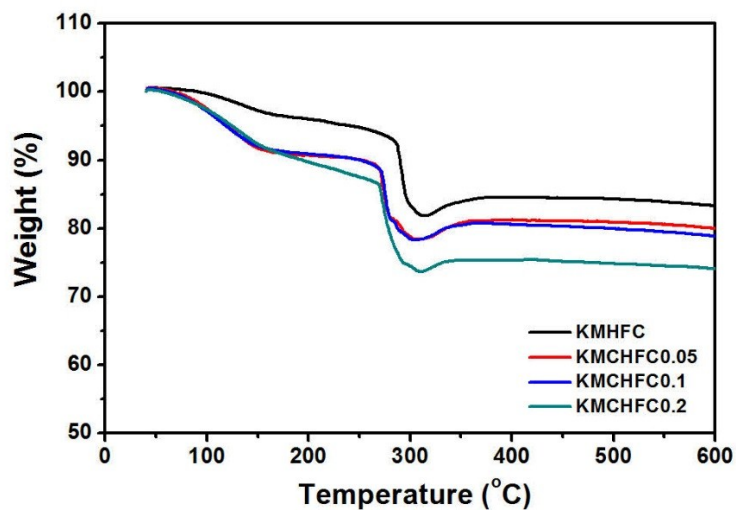


Fig. S2 TG curve of KMCHFC ($x=0, 0.05, 0.1, 0.2$). TG measurement was carried out at a heating rate of $10\text{ }^{\circ}\text{C min}^{-1}$ in air.

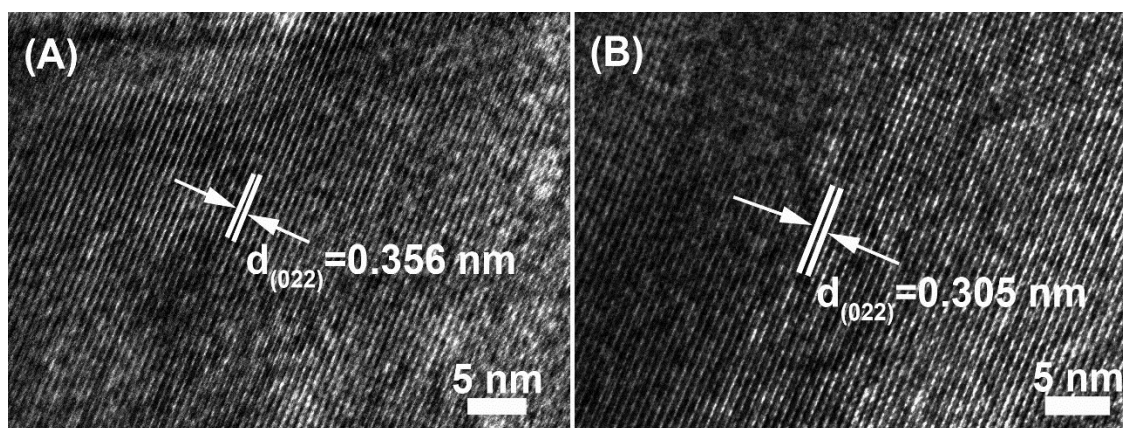


Fig.S3 HRTEM images of (A) KMHFC and (B) KMCHFC ($x=0.1$).

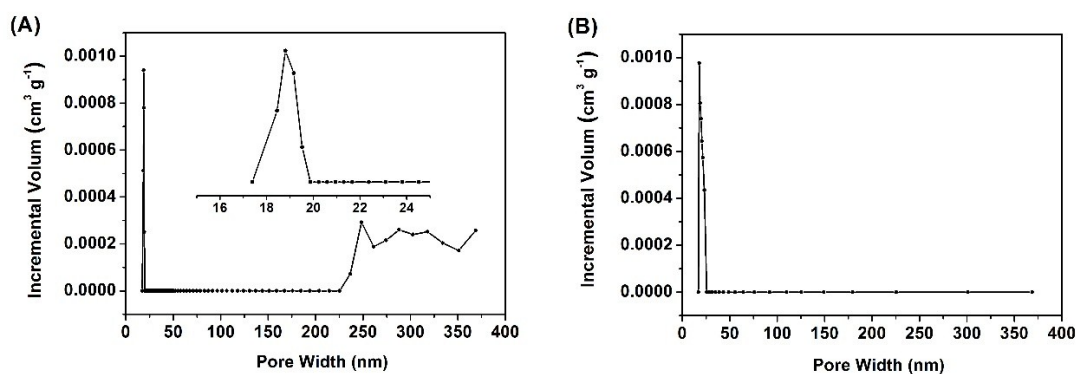


Fig. S4 The pore-size-distribution curves of (A) KMHFC and (B) KMCHFC ($x=0.1$) using DFT method. The model is N_2 -cylindrical pores in an Oxide surface at 77K.

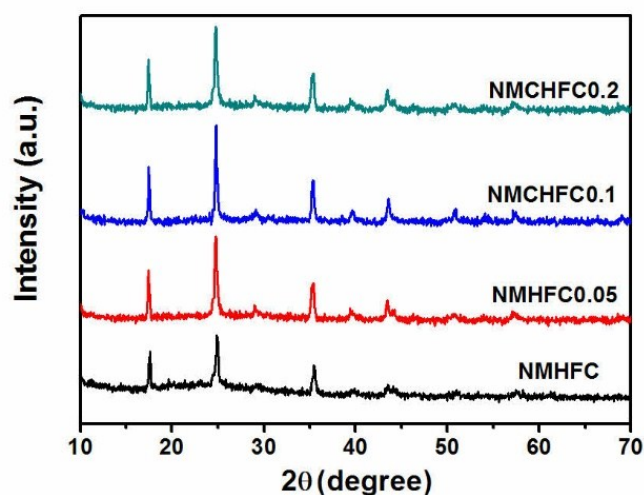


Fig. S5 XRD patterns of KMCHFC ($x=0, 0.05, 0.1, 0.2$) after 1 cycle.

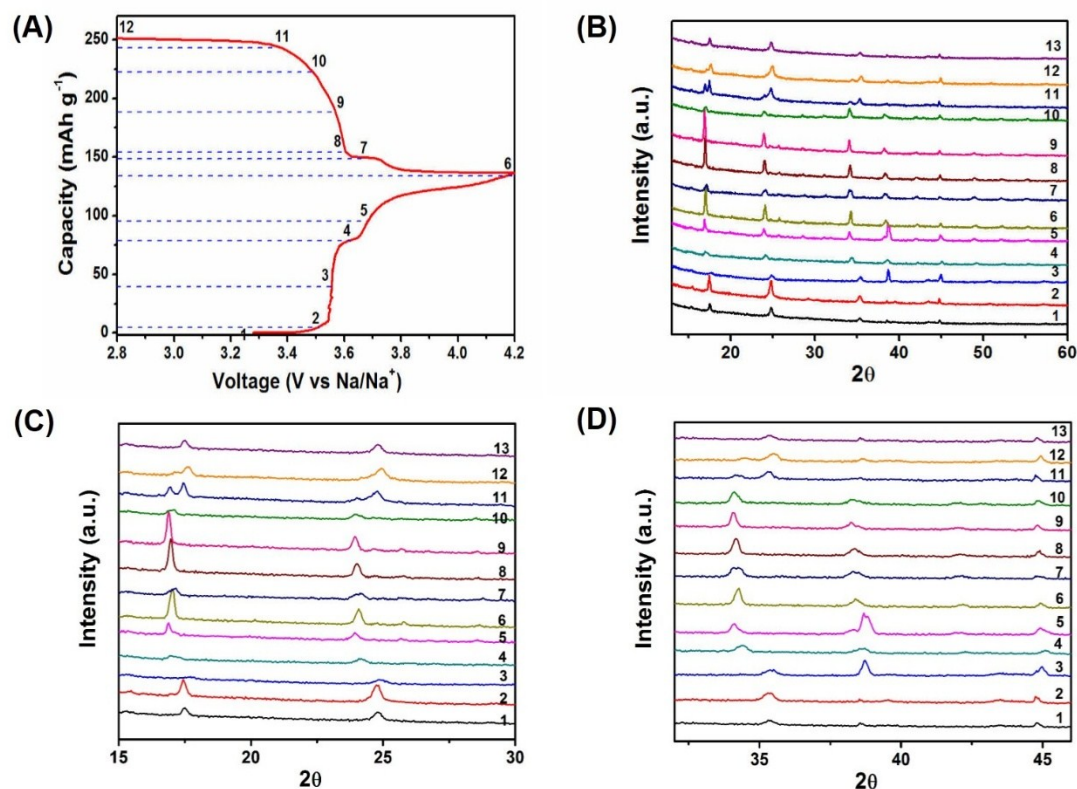


Fig. S6 (A) Charge/discharge profiles of the KMCHFC ($x=0.1$) electrode tested at 1st charge-discharge process, the numbers 1-12 stand for the depths of charge/discharge; (B) XRD patterns of the electrode at various states (the number 13 was taken for the electrode when the voltage goes down to 2 V); (C-D) The corresponding magnified

XRD patterns.

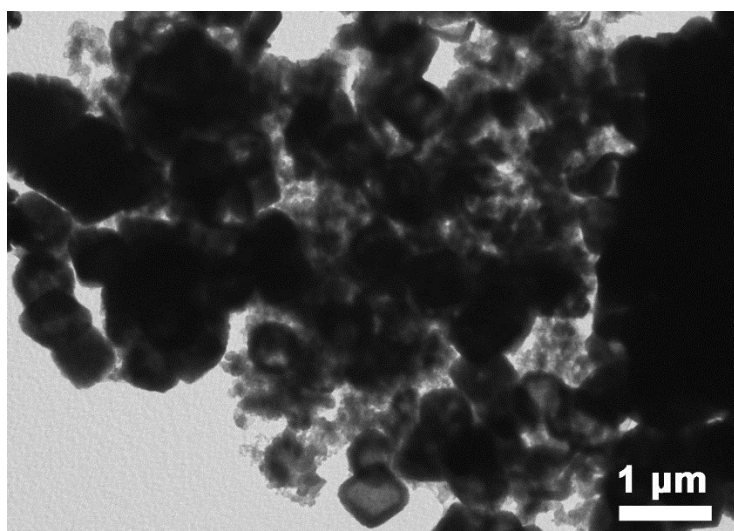


Fig. S7 TEM images of the electrodes made of KMCHFC ($x=0.1$) after 150 cycles.

Table S1 Unit cell parameters of $K_2Mn_{1-x}Co_xFe(CN)_6$ ($x=0, 0.05, 0.1, 0.2$)

Samples	a (Å)	b (Å)	c (Å)
KMHFC	15.12	15.12	18.20
KMCHFC ($x=0.05$)	15.09	15.09	18.09
KMCHFC ($x=0.1$)	15.07	15.07	17.98
KMCHFC ($x=0.2$)	15.04	15.04	17.89

Table S2 Unit cell parameters of $K_2Mn_{1-x}Co_xFe(CN)_6$ ($x=0, 0.05, 0.1, 0.2$) after 1 cycle

Samples	a (Å)	b (Å)	c (Å)
NMHFC	15.10	15.10	18.14
NMCHFC ($x=0.05$)	15.06	15.06	18.07
NMCHFC ($x=0.1$)	15.02	15.02	17.95
NMCHFC ($x=0.2$)	14.98	14.98	17.84

Table S3 EIS parameters and diffusion coefficient of sodium ion for KMCHFC ($x=0$, 0.05, 0.1, 0.2)

Samples	R_s (Ω)	R_f (Ω)	R_{ct} (Ω)	σ ($\Omega \text{ cm}^2 \text{ s}^{-0.5}$)	D ($\text{cm}^2 \text{ s}^{-1}$)
$x=0$	5.0	358.9	2120	83.0	5.27E-14
$x=0.05$	3.9	264.8	1910	63.5	9.01E-14
$x=0.1$	3.5	220.0	992	3.0	4.04E-11
$x=0.2$	3.2	194.5	1640	50.0	1.45E-13