

Electronic Supplementary File

Na_{2.3}Cu_{1.1}Mn₂O_{7-δ} nanoflakes as enhanced cathode materials for high-energy sodium-ion batteries achieved by a rapid pyrosynthesis approach†

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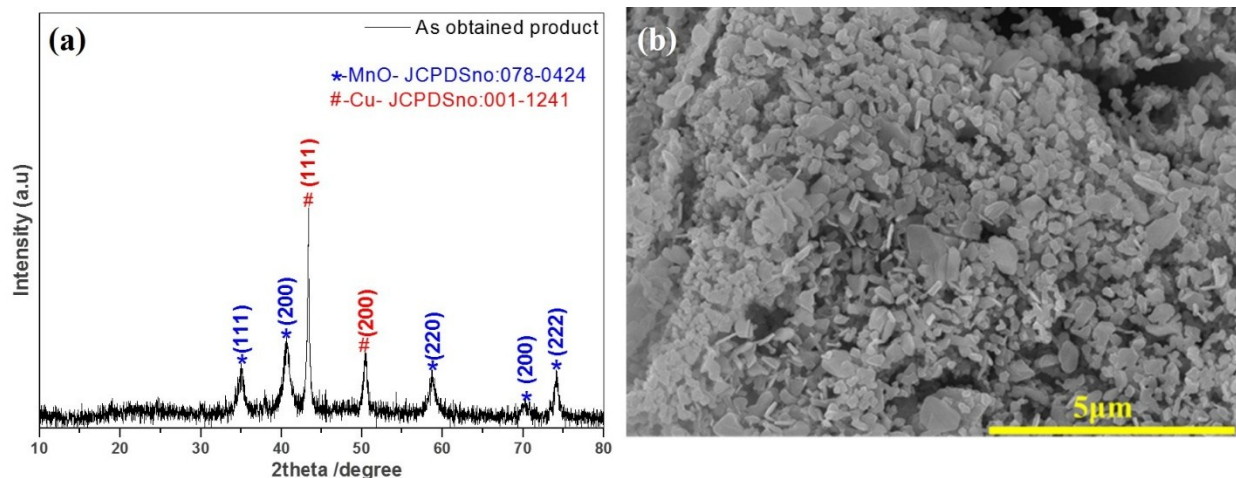


Fig. S1. (a) PXRD pattern of the combustion deposits (b) SEM image of the combustion deposits.

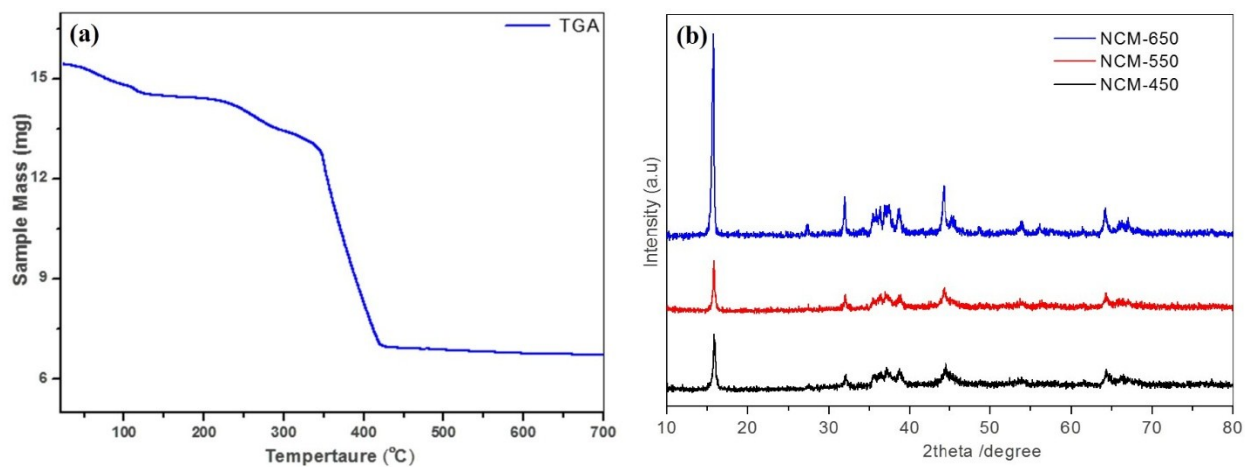


Fig. S2. (a) TG plot for $\text{Na}_{2.3}\text{Cu}_{1.1}\text{Mn}_2\text{O}_{7.6}$ nanodiscs under air atmosphere at $5^\circ\text{C}/\text{min}$, (b) PXRD pattern for $\text{Na}_{2.3}\text{Cu}_{1.1}\text{Mn}_2\text{O}_{7.6}$ obtained at different temperatures.

Element	Wyckoff Positions			SOF	B _{iso}
	x	y	z		
Na	0.35533	0.39403	0.90521	0.6	1.2563
Na	0.39069	0.91516	0.85114	1	0.84523
Na	0.61369	0.08403	0.3647	1	1.89563
Na	0.02416	0.55666	0.39748	1	0.986
Na	0.25408	0.71021	0.05205	1	1.69253
Cu	0.10795	0.0213	-0.00018	0.73	0.98654
Cu	0.25587	0.27704	0.41366	0.73	1.15633
Cu	0.1252	0.13265	0.67467	0.73	1.98542
Mn	0.44928	0.39066	0.14224	1	1.2653
Mn	0.88833	0.85148	0.27072	1	0.99786
Mn	0.74833	0.73209	0.57559	1	0.36548
Mn	0.58697	0.56874	0.85726	1	0.2564
O	0.81613	0.7482	0.8184	1	1.0256
O	0.40108	0.57027	0.57437	1	0.56846
O	0.8507	0.01723	0.76468	1	1.6987
O	0.4905	0.28773	0.69957	1	0.5489
O	0.72062	0.82265	0.03224	1	1.28315
O	0.66253	0.42435	0.38591	1	0.587
O	0.25082	0.43003	0.8788	1	0.4586
O	0.00302	0.86916	0.52292	1	1.02548
O	0.74766	0.53118	0.10741	1	1.16548
O	0.6623	0.75732	0.28137	1	0.65422
O	0.35637	0.13462	-0.03734	1	1.53248
R _{wp} = 4.009, R _p = 2.73, R _{exp} = 3.42, GoF = 1.36					
a = 6.46728 Å, b = 7.22589 Å, c = 7.63356 Å					
α = 103.2434°, β = 110.0294°, γ = 111.3249°					

Table S1 Crystallographic data of the NCuMnO-650 powder obtained from Rietveld refinement.

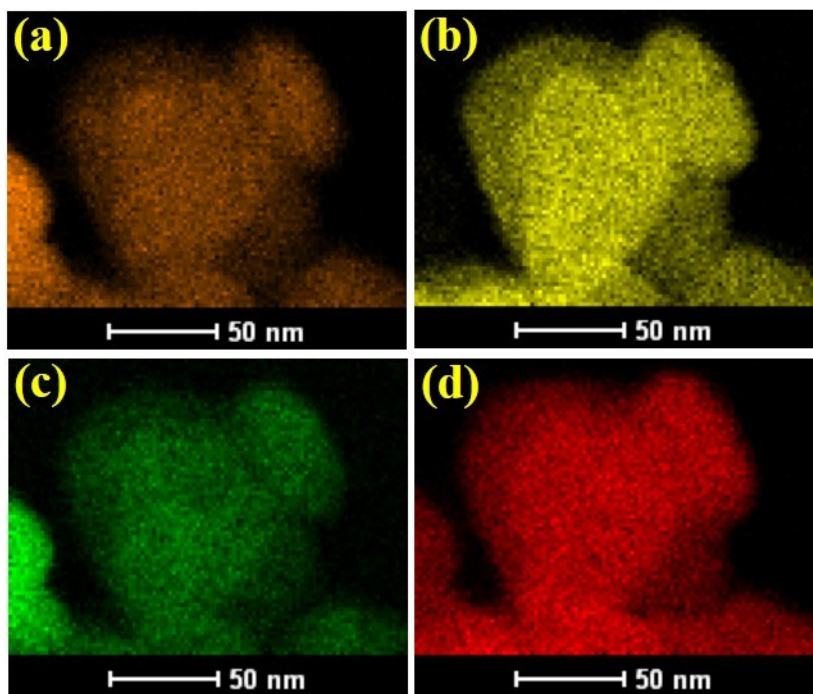


Fig. S3. Elemental mapping analysis of NCuMnO powder; bright filed image with corresponding elements, (a) Na, (b) Cu, (c) Mn and (O).

Table S2. ICP-OES analysis of NCuMnO powder.

Element	Wavelength (nm)	Concentration (wt %)
Na	589.592	12.0
Cu	327.393	20.4
Mn	257.61	31.9

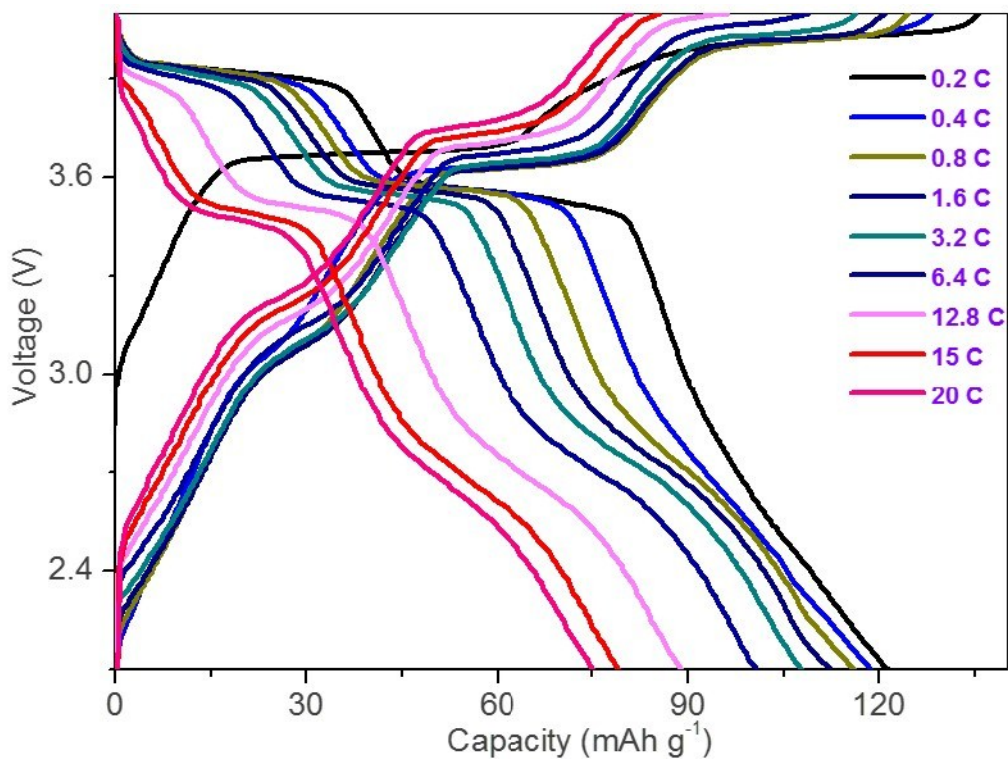


Fig. S4. Charge/discharge pattern for $\text{Na}_{2.3}\text{Cu}_{1.1}\text{Mn}_2\text{O}_{7.6}$ obtained at different C rate.

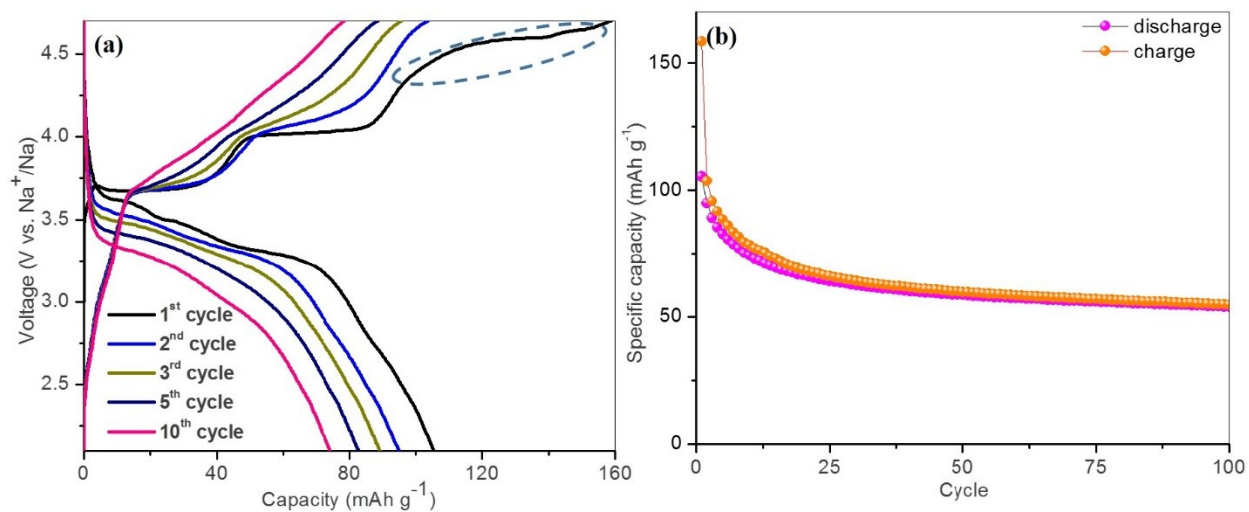


Fig. S5. (a) charge/discharge pattern for oxygen-redox region of $\text{Na}_{2.3}\text{Cu}_{1.1}\text{Mn}_2\text{O}_{7.6}$ obtained between 4.7 and 2.1 V, (b) corresponding cycle stability of the oxygen-redox region of NCuMnO between 4.7 and 2.1 V.

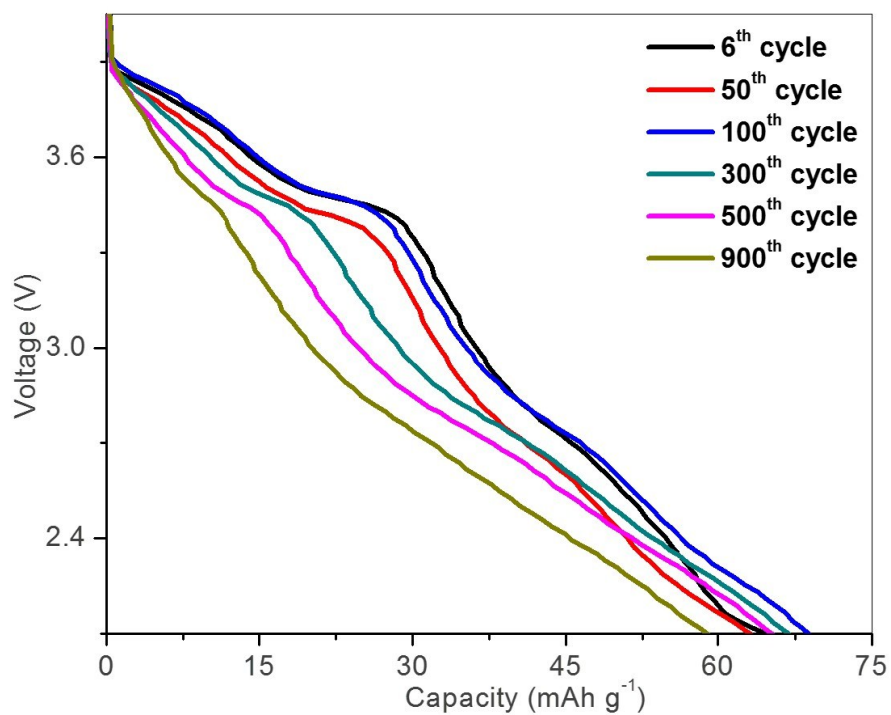


Fig. S6. Discharge pattern for NCuMnO-650 sample obtained at 10C rate.

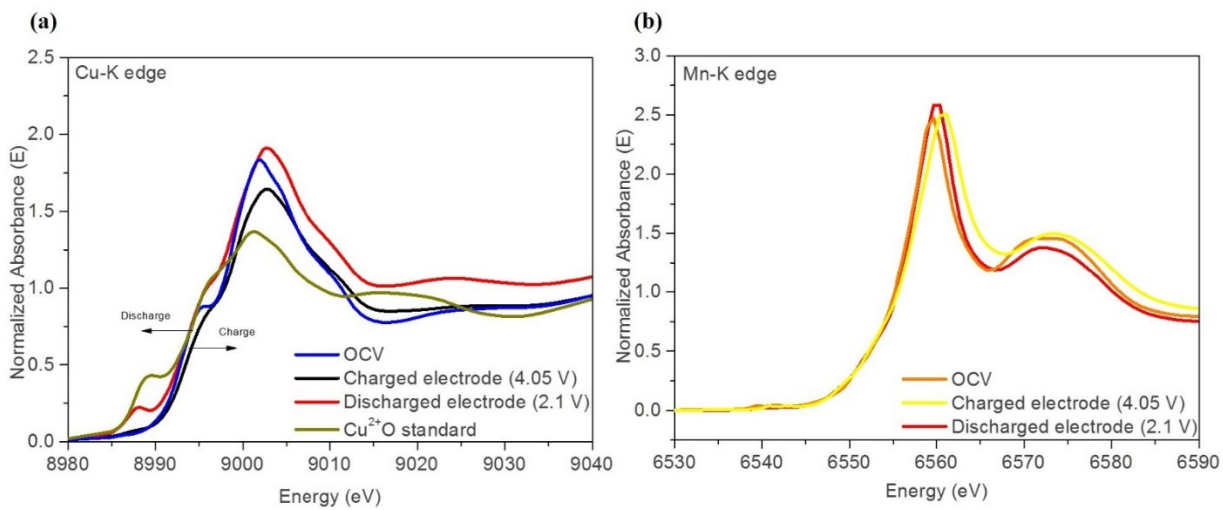


Fig. S7. *Ex situ* XANES spectra obtained for the $\text{Na}_{0.3}\text{Cu}_{1.1}\text{Mn}_{2.7-6}\text{O}_7$ cathode under different states of charge/discharge conditions (a) Cu-K edge, and (b) Mn-K edge.

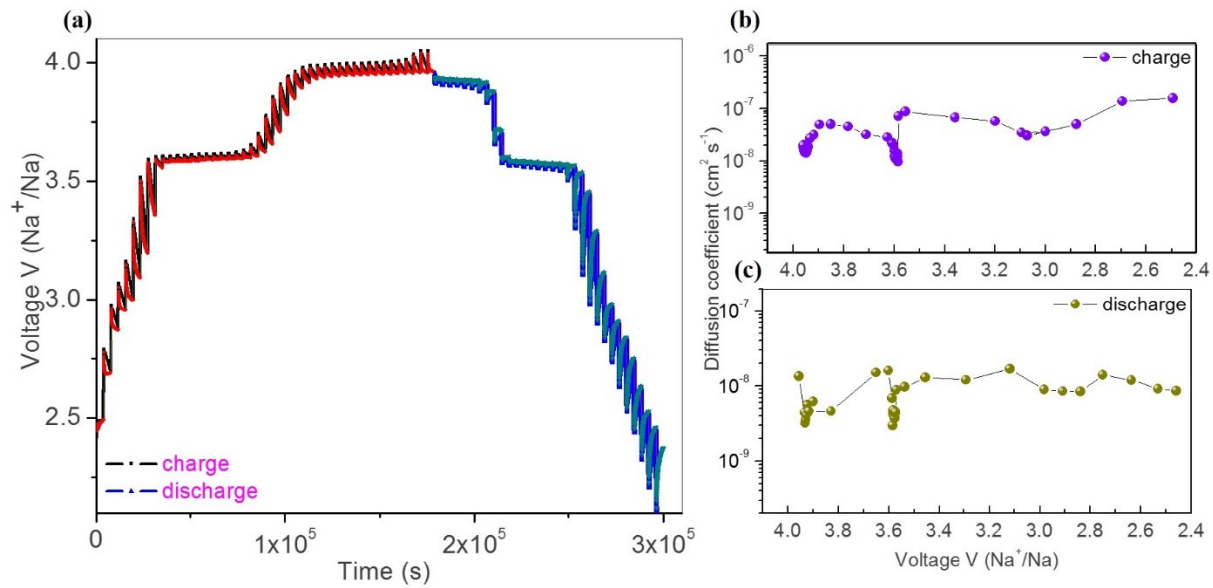


Fig. S8 (a) Voltage profile of NCuMnO-650 cathode during GITT at 20 mA g^{-1} for the 21st cycle, sodium ion chemical diffusion coefficient calculated from GITT curves during electrochemical reaction (b) charge and (c) discharge.