

Supporting Information

Copper substituted P2-type $\text{Na}_{0.67}\text{Cu}_x\text{Mn}_{1-x}\text{O}_2$: a stable high-power sodium-ion battery cathode

Wenpei Kang^{a,b}, Zhenyu Zhang^{a,b}, Pui-Kit Lee,^c Tsz-Wai Ng^{a,b}, Wenyue Li^{a,d},
Yongbing Tang^{a,d}, Wenjun Zhang^{a,b}, Chun-Sing Lee^{a,b*} and Denis Yau Wai Yu^{a,c*}

a Center of Super-Diamond and Advanced Films (COSDAF), City University of Hong Kong, Hong Kong SAR, People's Republic of China.

b Department of Physics and Materials Science, City University of Hong Kong, Hong Kong SAR, People's Republic of China.

c School of Energy and Environment, City University of Hong Kong, Hong Kong SAR, People's Republic of China.

d Functional Thin Films Research Center, Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, People's Republic of China.

E-mail: denisyu@cityu.edu.hk; apcslee@cityu.edu.hk; Tel: +852-34426885

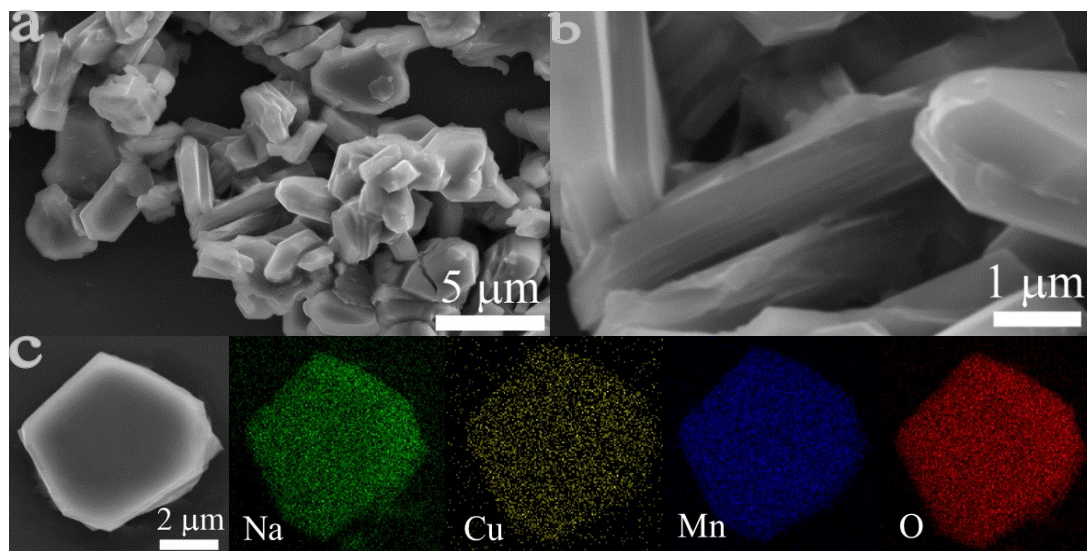


Fig. S1 (a, b) SEM images, (c) EDX mapping images of $\text{Na}_{0.67}\text{Cu}_{0.25}\text{Mn}_{0.75}\text{O}_2$.

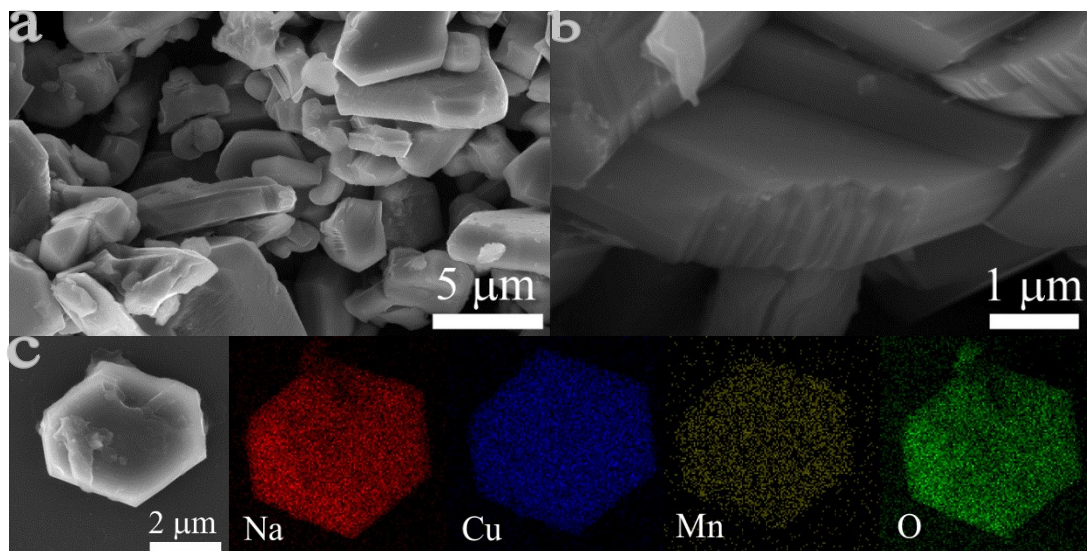


Fig.S2 (a, b) SEM images, (c) EDX mapping images of $\text{Na}_{0.67}\text{Cu}_{0.33}\text{Mn}_{0.67}\text{O}_2$.

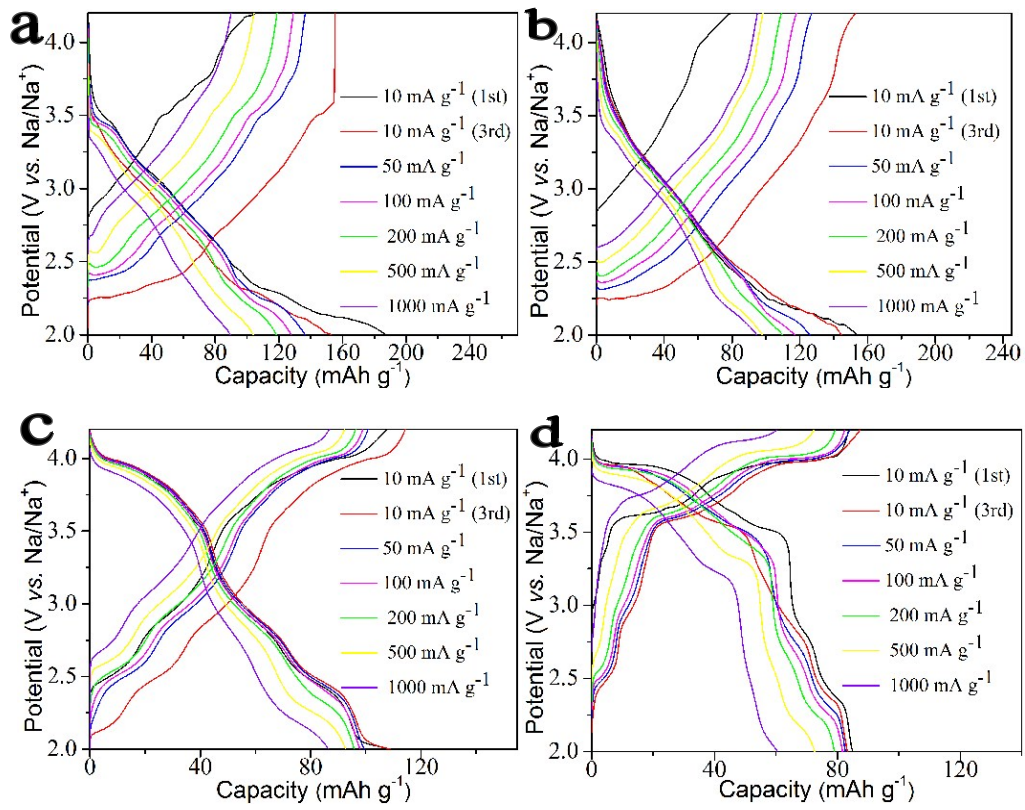


Fig. S3 Representative charge–discharge curves of the electrode at different current density with various $\text{Na}_{0.67}\text{Cu}_x\text{Mn}_{1-x}\text{O}_2$ samples: (a) $x = 0$, (b) $x = 0.14$, (c) $x = 0.25$ and (d) $x = 0.33$.

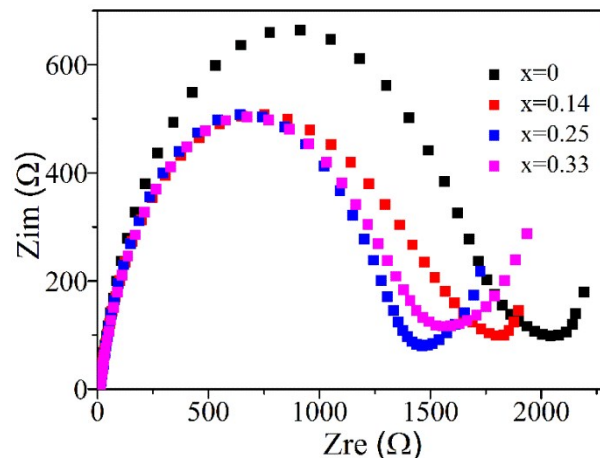


Fig.S4 Nyquist plots in the range of 100 kHz to 10 mHz of the $\text{Na}_{0.67}\text{Cu}_x\text{Mn}_{1-x}\text{O}_2$ electrode in a fresh cell.

Tab. S1 Results of Na-Mn-O based cathode materials found in the literature

Material	Initial capacity (mAh g ⁻¹)	Test current (mA g ⁻¹)	Capacity	capacity retention	Ref
Na _x MnO _{2+z}	140	200	84/100th	60%	25
Na _{0.7} MnO ₂	125	180	~70/50th	56%	26
Na _{2/3} Co _{1/2} Mn _{1/2} O ₂	123	30	85/30th	69%	27
Na _{2/3} Ni _{1/3} Mn _{2/3} O ₂	150	10	104/30th	69%	28
Na _{2/3} Fe _{1/3} Mn _{2/3} O ₂	191	12	153/40th	80%	29
Na _x Fe _{1/2} Mn _{1/2} O ₂	185	6	~120/50th	65%	30
Na _{2/3} Fe _{1/2} Mn _{1/2} O ₂	190	12	~150/30th	79%	31
Na _{2/3} Fe _{1/2} Mn _{1/2} O ₂ @Graphene	91	12	60/140th	66%	32
Na _{0.67} Mg _{0.1} Mn _{0.9} O ₂	170	12	~130/25th	76%	33
Na _{2/3} [Mg _{0.28} Mn _{0.72}]O ₂	210	10	~150/30th	71%	34
Na _{0.68} Cu _{0.34} Mn _{0.66} O ₂	70	~20	43/1000th	61%	35
Na _{0.5} [Ni _{0.23} Fe _{0.13} Mn _{0.63}]O ₂	175	100	120/100th	69%	36
NaNi _{1/3} Fe _{1/3} Mn _{1/3} O ₂	120	75	100/150th	83%	37
Na _{0.67} [Ni _{0.15} Co _{0.2} Mn _{0.65}]O ₂	141	20	123/50th	87%	38
Na _{2/3} Ni _{1/9} Co _{2/3} Mn _{2/9} O ₂	110	12.6	~100/90th	91%	39
Na _x Ni _{0.22} Co _{0.11} Mn _{0.66} O ₂	130	12	~99/200th	76%	40