Durable Cu-doped P3-type Na_{0.62}Mn_{0.75}Cu_{0.19}O₂ Cathodes for High-Capacity Sodium-ion Battery

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Sample	Measured atomic ratios			
	Na	Mn	Cu	
x=0	0.586	0.959	-	
x= 0.09	0.644	0.841	0.093	
x=0.19	0.655	0.745	0.191	
x=0.28	0.654	0.641	0.284	

 Table S2.
 Summary of XRF result

Sample	weight % of elements			
-	Na	Mn	Cu	0
Na _{0.62} Mn _{0.75} Cu _{0.19} O ₂	15.22	40.69	12.90	31.181

 Table S3. Rietveld refinement as-prepared Cu-doped powders.

sample	a(Â)	b(Â)	c(Â)	Fraction (%) P3:P1
Na _{0.62} Cu _{0.09} Mn _{0.9} O ₂	2.8805	2.8805	16.7103	88:12
Na _{0.62} Cu _{0.19} Mn _{0.75} O ₂	2.8807	2.8807	16.7113	93.4: 6.6
Na _{0.62} Cu _{0.28} Mn _{0.65} O ₂	2.8903	2.8903	16.749	94.3 : 5.7

Table S4. Detailed Rietveld refinement as-prepared Cu-doped powders.

Atom	x(Â)	y(Â)	z(Â)	occup.	в
01	0	0	0.612/0.62/0.638	1	0.5
02	0	0	0.388/0.386/0.38	1	0.5
Mn1	0	0	0	0.85/0.75/0.65	0.5
Cu1	0	0	0	0.09/0.19/0.28	0.5
Na1	0	0	0.838/0.839/0.86	1	0.5



Figure S1. XRD Rietveld refinement of Na_{0.62}Mn_{1-x}Cu_xO₂: a) undoped, b) x=0.09 and c) x=0.28.

The refined cell parameters for undoped material were : a=6.6058 Å, b=6.8190 Å, and c = 7.4781Å.



Figure S2. The corresponding dQ/dV plot of Na_{0.62}Mn_{0.75}Cu_{0.19}O₂



Figure S3 Galvanostatic charge/discharge profile at the current of 20 mA g^{-1} : a) x=0.09 and b) x=0.28.



Figure S4 Cycling performance of $Na_{0.62}Mn_{1-x}Cu_xO_2$



Figure S5 Ex situ XPS spectra of the electrode: O 1s



Figure S6 HR-TEM images with TEM EDS mapping of undoped powder



Figure S7 Operando XRD patterns of the first charge/discharge at 1.5–4.7 V undoped material



Figure S8 The corresponding dQ/dV plots of undoped material



Figure S9 *ex situ* XRD patterns of Na_{0.62}Cu_{0.19}Mn_{0.75}O₂ after 1st charge and 1st discharge



Figure S10 ex situ XRD patterns of $Na_{0.62}Cu_{0.19}Mn_{0.75}O_2$ after 30 cycles