

SUPPLEMENTARY INFORMATION

Mechanochemical Synthesis of Li_2MnO_3 Shell/ LiMO_2 (M = Ni, Co, Mn)

Core-Structured Nanocomposites for Lithium-Ion Batteries

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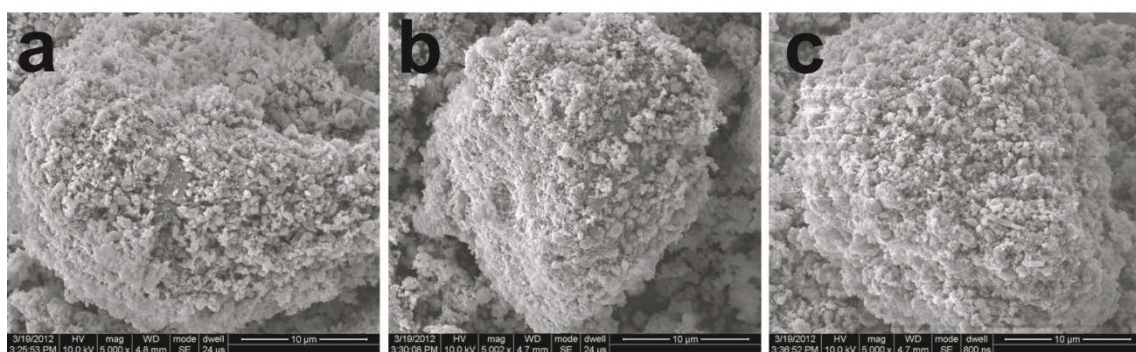


Figure S1. SEM images of $x\text{Li}_2\text{MnO}_3 \cdot (1-x)\text{LiNi}_{0.5}\text{Co}_{0.2}\text{Mn}_{0.3}\text{O}_2$ (a) $x = 0.3$, (b) $x = 0.5$, (c) $x = 0.7$ heat-treated at $700\text{ }^\circ\text{C}$.

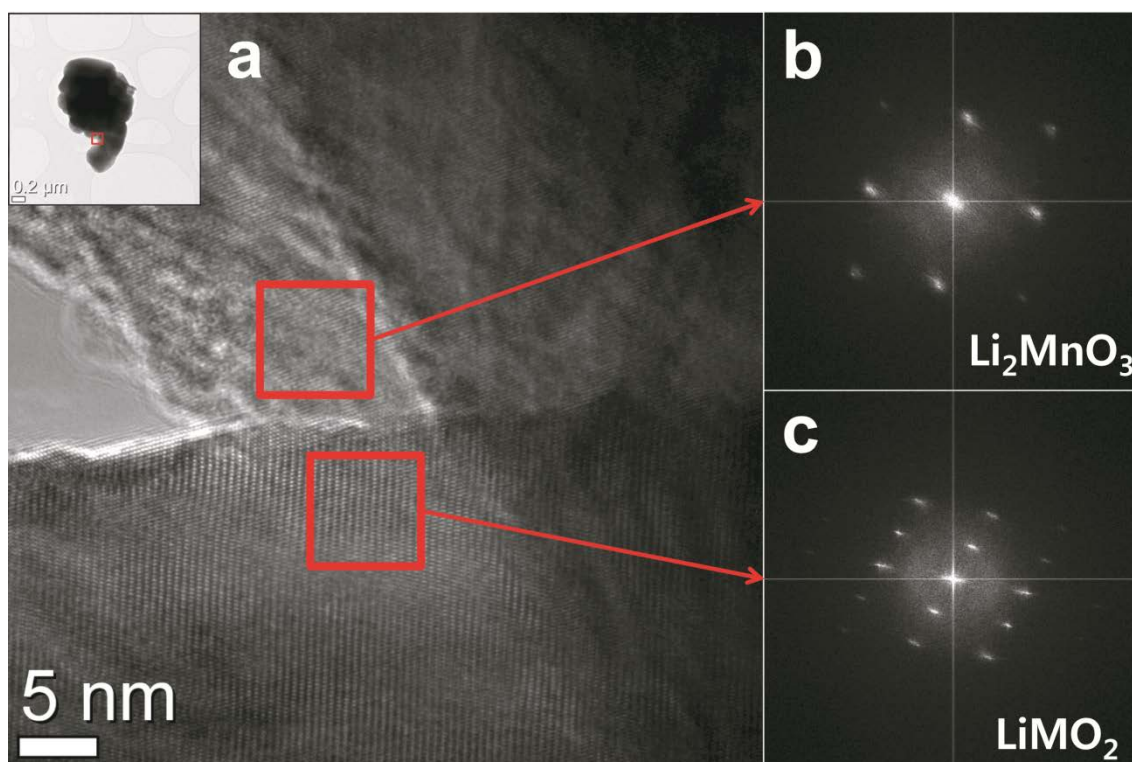


Figure S2. (a) HR-TEM image of $0.5\text{Li}_2\text{MnO}_3 \cdot 0.5\text{LiNi}_{0.5}\text{Co}_{0.2}\text{Mn}_{0.3}\text{O}_2$ heat treated at $1000\text{ }^\circ\text{C}$, (b) and (c) FFTs of the regions indicated in (a).

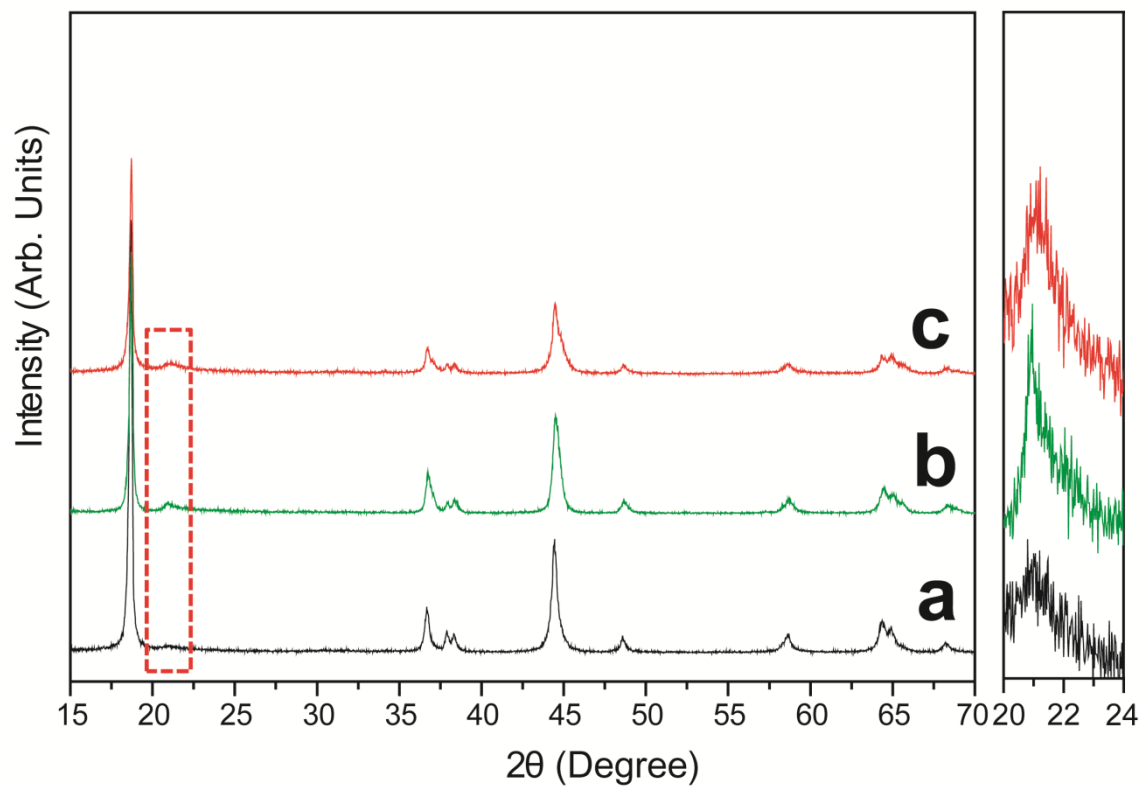


Figure S3. XRD patterns of $x\text{Li}_2\text{MnO}_3 \cdot (1-x)\text{LiNi}_{0.5}\text{Co}_{0.2}\text{Mn}_{0.3}\text{O}_2$ for (a) $x = 0.3$, (b) $x = 0.5$, (c) $x = 0.7$ heat-treated at 400 °C.

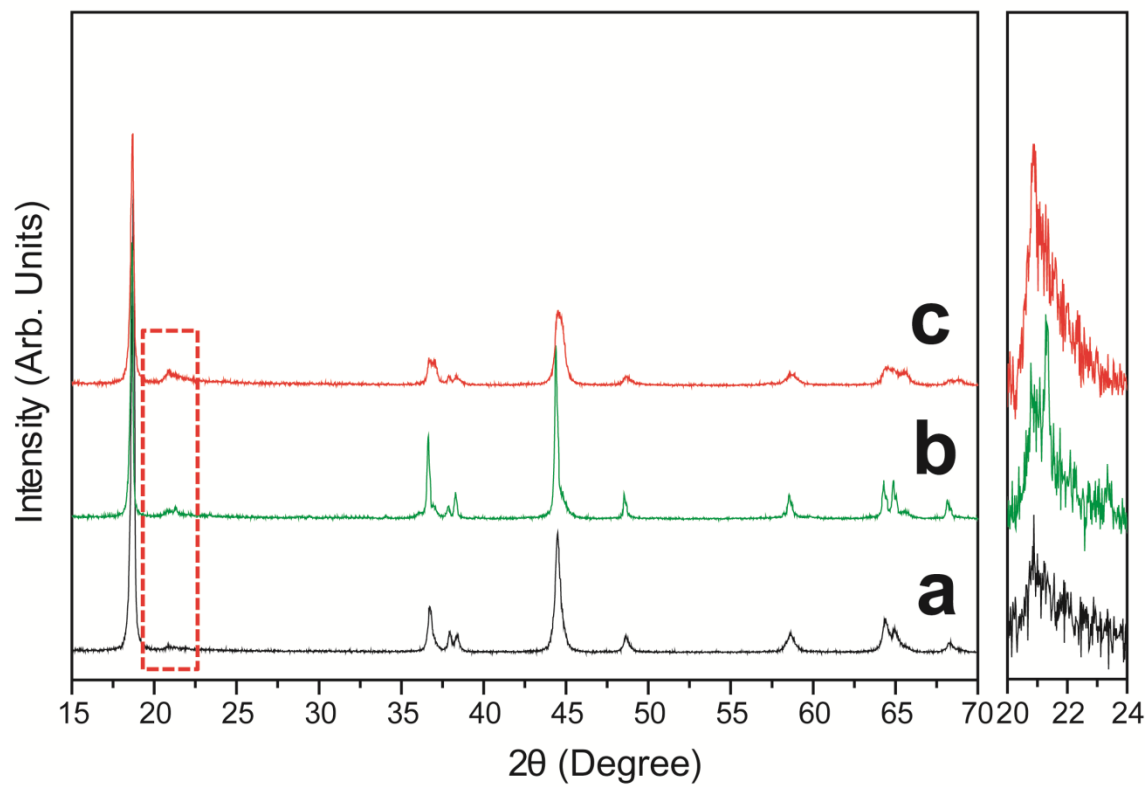


Figure S4. XRD patterns of $x\text{Li}_2\text{MnO}_3 \cdot (1-x)\text{LiNi}_{0.5}\text{Co}_{0.2}\text{Mn}_{0.3}\text{O}_2$ for (a) $x = 0.3$, (b) $x = 0.5$, (c) $x = 0.7$ heat-treated at 700 °C.

Table S1. Lattice parameters, c/a ratio and crystallite size of the $x\text{Li}_2\text{MnO}_3 \cdot (1-x)\text{LiNi}_{0.5}\text{Co}_{0.2}\text{Mn}_{0.3}\text{O}_2$. (A : Li_2MnO_3 , B : $\text{LiNi}_{0.5}\text{Co}_{0.2}\text{Mn}_{0.3}\text{O}_2$)

T (°C)	Sample	a (Å)	c (Å)	c/a	Crystallite size (Å)
400	0.3A · 0.7B	2.8689	14.2213	4.9570	138.0
	0.5A · 0.5B	2.8706	14.2228	4.9546	78.3
	0.7A · 0.3B	2.8720	14.2238	4.9526	41.6
700	0.3A · 0.7B	2.8679	14.2289	4.9614	314.6
	0.5A · 0.5B	2.8695	14.2349	4.9607	276.0
	0.7A · 0.3B	2.8710	14.2403	4.9601	249.8
1000	0.3A · 0.7B	2.8632	14.2358	4.9719	491.0
	0.5A · 0.5B	2.8577	14.2351	4.9813	480.0
	0.7A · 0.3B	2.8620	14.2585	4.9821	452.0

Table S2. Capacities of the $x\text{Li}_2\text{MnO}_3 \cdot (1-x)\text{LiNi}_{0.5}\text{Co}_{0.2}\text{Mn}_{0.3}\text{O}_2$ ($x = 0.3, 0.5, 0.7$)at 10 mA g^{-1} (1/20 C) at different temperatures.

T (°C)	Sample	1 st charge capacity (mAh g ⁻¹)	1 st discharge capacity (mAh g ⁻¹)	Eff. (%)	2 nd charge capacity (mAh g ⁻¹)	2 nd discharge capacity (mAh g ⁻¹)	Eff. (%)
	$\text{Li}_2\text{MnO}_3(\text{A})$	361.4	225.2	62.3	258.4	206.3	79.8
	$\text{LiNi}_{0.5}\text{Co}_{0.2}\text{Mn}_{0.3}\text{O}_2(\text{B})^{\text{a}}$	215.4	145.4	67.5	176.3	136.8	77.6
400	0.3A · 0.7B	219.9	180.4	82.0	206.5	181.9	88.1
	0.5A · 0.5B	219.8	155.3	70.7	207.9	159.0	76.5
	0.7A · 0.3B	269.1	175.3	65.1	216.2	172.1	79.6
700	0.3A · 0.7B	246.2	183.3	74.5	193.3	179.9	93.1
	0.5A · 0.5B	233.1	172.4	74.0	186.9	171.3	91.7
	0.7A · 0.3B	222.0	151.9	68.4	181.4	164.6	90.7
1000	0.3A · 0.7B	262.2	207.2	79.0	211.0	203.4	96.4
	0.5A · 0.5B	299.8	228.9	76.4	231.6	226.2	97.7
	0.7A · 0.3B	302.9	206.3	68.1	219.4	213.3	97.2

^a Tested with different ratios of active material : binder : carbon = 93 : 3 : 4 with Ketjen black (KB-500JD)