

Linicomno2 Ni Co Mn 8 1 1 Ncm 811 Cathode Material Lithium Ion Battery High Nickel Ternary Nmc

Item Number: CL04



Introduction

High nickel NCM 811 LiNiCoMnO₂ cathode material delivering exceptional energy density high specific capacity and superior cycle stability for next generation lithium ion battery cell research and development across commercial pouch cylindrical and prismatic formats.

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Application	Description	Key Benefit
Electric Vehicle (EV) Traction Batteries	Active cathode active material for high-capacity NMC 811 automotive pouch and prismatic cells.	Maximizes gravimetric energy density to extend driving range while maintaining robust cycle life.
Solid-State Battery Research	Integration into sulfide- and oxide-based solid-state lithium battery architectures.	High structural stability and low surface reactivity reduce interphase resistance with solid electrolytes.
Aerospace and Drone Power Systems	Lightweight, high-discharge battery packs requiring maximum energy-to-weight ratios.	High specific capacity (>210 mAh/g) reduces total pack weight without sacrificing power output.
Consumer Electronics (3C Devices)	Thin-profile pouch cells for premium laptops, smartphones, and wearable electronic devices.	High compacted density ($\geq 3.2 \text{ g/cm}^3$) maximizes volumetric capacity in ultra-compact form factors.
Grid and Industrial Energy Storage	Utility-scale energy storage systems subject to rigorous daily cycling protocols.	High capacity retention (>91% at room temperature after 50 cycles) ensures long operational life.
Academic and Industrial Battery R&D	Standardized positive electrode reference material for half-cell and full-cell coin/pouch testing.	High batch-to-batch consistency enables reproducible electrochemical benchmarking and binder evaluation.
High-Rate Discharge Equipment	Power tools, robotic manipulators, and medical equipment requiring fast C-rate capability.	Stable rate performance across 0.1C to 2C continuous discharge regimes with minimal polarization.

Parameter	Value / Standard
Product Item Number	CL04
Chemical Formula	$\text{LiNi}_{0.8}\text{Co}_{0.1}\text{Mn}_{0.1}\text{O}_2$ (NCM 811 / NMC 811)
Available Structural Variants	Single Crystal Ni83 (CL04-M2S) / Polycrystalline Standard (CL04-M2C)
Standard Packaging	500 g / sealed vacuum aluminum foil bag

Inspection Parameter	Unit	Variant CL04-M2S (Single Crystal Ni83)	Variant CL04-M2C (Polycrystalline)	Testing Method / Instrument
Particle Size Distribution D10	μm	—	5.0 ± 1.0	Laser Diffraction (Mastersizer 2000)
Particle Size Distribution D50	μm	4.0 ± 1.0 (Typical: 3.6)	10.0 ± 2.0	Laser Diffraction (Mastersizer 2000)
Particle Size Distribution D90	μm	—	20.0 ± 4.0	Laser Diffraction (Mastersizer 2000)
Maximum Particle Size (Dmax)	μm	—	≤ 40.0	Laser Diffraction (Mastersizer 2000)
Specific Surface Area (SSA)	m^2/g	0.6 ± 0.2 (Typical: 0.65)	0.6 ± 0.3	BET Nitrogen Adsorption (TriStar 3000)

Inspection Parameter	Unit	Variant CL04-M2S (Single Crystal Ni83)	Variant CL04-M2C (Polycrystalline)	Testing Method / Instrument
Tap Density	\$g/cm^3\$	—	\$\ge 2.1\$	Tap Density Meter
Powder Compacted Density	\$g/cm^3\$	—	\$\ge 3.2\$	Hydraulic Powder Press
Moisture Content	\$ppm\$	—	\$\le 600\$	Karl Fischer Coulometer @ 250°C (Metrohm 831/860)
pH Value	—	\$\le 11.70\$ (Typical: 11.50)	\$\le 11.80\$	pH Meter (Mettler Toledo FE30)
Residual Alkali: \$LiOH\$ / \$OH^-\$	\$wt\%\$	\$\le 0.30\$ (Typical: 0.21)	\$\le 0.40\$	Potentiometric Titration (Mettler Toledo G20)
Residual Alkali: \$Li_2CO_3\$ / \$CO_3^{2-}\$	\$wt\%\$	\$\le 0.30\$ (Typical: 0.09)	\$\le 0.30\$	Potentiometric Titration (Mettler Toledo G20)
Magnetic Impurities (\$Fe + Cr\$)	\$ppb\$	—	\$\le 100\$	ICP-OES (Optima 2100DV)
0.1C Specific Capacity (3.0–4.3V)	\$mAh/g\$	\$210 \pm 5\$ (Typical: 210.2)	\$\ge 205\$	CR2016 Coin Half-Cell vs. \$Li/Li^+ +\$
Initial Coulombic Efficiency	\$\%\$	\$89 \pm 1\$ (Typical: 89.6)	\$\ge 88\$	CR2016 Coin Half-Cell (0.1C / 0.1C)

Cycle Step / Rate Protocol	Charge Capacity (\$mAh/g\$)	Discharge Capacity (\$mAh/g\$)	Coulombic Efficiency (\$\%\$)	Capacity Retention (\$\%\$)
1st Cycle (0.1C / 0.1C)	234.5	210.2	89.6	100.0 (Base)
2nd Cycle (0.5C / 0.5C)	—	196.7	—	—
3rd Cycle (0.5C / 1.0C)	—	190.5	—	—
4th Cycle (0.5C / 2.0C)	—	183.5	—	—
5th Cycle (0.5C / 1.0C)	—	190.2	—	—
55th Cycle (0.5C / 1.0C)	—	174.5	—	91.7 (at 50th Cycle)

Cycle Step / Rate Protocol	Charge Capacity (\$mAh/g\$)	Discharge Capacity (\$mAh/g\$)	Coulombic Efficiency (\$\%\$)	Capacity Retention (\$\%\$)
1st Cycle (0.1C / 0.1C)	242.2	222.2	91.7	100.0 (Base)
2nd Cycle (0.5C / 0.5C)	—	213.8	—	—
3rd Cycle (0.5C / 1.0C)	—	208.1	—	—
4th Cycle (0.5C / 2.0C)	—	201.6	—	—
5th Cycle (0.5C / 1.0C)	—	206.3	—	—
55th Cycle (0.5C / 1.0C)	—	191.9	—	93.0 (at 50th Cycle)