

# Conductive Nanotubes Composite Additive

MWNTs Outer Diameter : 60-80-nm

MWNTs Length:10-15  $\mu\text{m}$

BET Nitrogen Surface Area :55-77 $\text{m}^2/\text{g}$

Adsorption Value :500-700 $\text{ml}/100\text{gm}$

Density :120  $\text{kg}/\text{m}^3$

Volume Resistivity :2 ~ 5x10

Conductive Nanotubes Additive is specifically formulated to improve lithium ion battery electrode performance. Nanotubes are excellent electrically conductive fibers. Nanotubes can form conductive networks easily in Lithium Ion battery electrodes which can help to prevent the electrode materials from degradation caused by the expansion and contraction of electrode materials during charging and discharging. When using our CNTC the capacity of battery does not decline with repeated cycling.

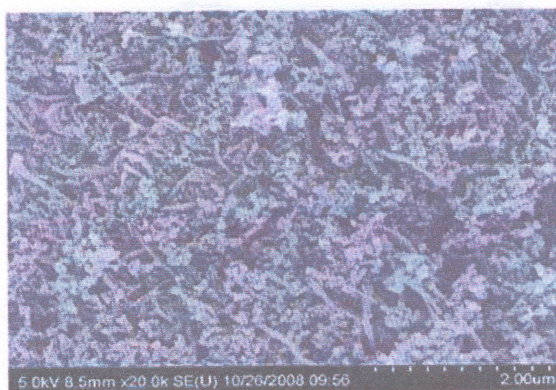
Dispersion of Carbon Nanotubes is known to be challenging due to the presence of bulk nanotubes which are normally highly entangled with each other. Cheap Tubes can now supply our Conductive Nanotubes Composite Additive (CNTC) with our standard MWNTs or our highly conductive graphitized MWNTs (GMWNTs). We can also supply this in Di Water or NMP solvents.

Our Conductive Nanotubes Composite is a Carbon Nanotubes based Conductive Additive for Lithium Ion Battery and other applications. It is a Nano Composite Material specifically designed for improving Lithium Ion Battery Performance. It is composed of Carbon Nanotubes and of grain electrode conductive additives (carbon black). By adding grain electrode conductive additives to Carbon Nanotubes, the entangled Nanotubes are well separated. As the result, the Conductive Nanotubes Composite Additive can be dispersed easily in Lithium Ion battery electrode materials. Additionally, due to the synergetic effect between the Carbon Nanotubes and the grain electrode materials, the discharge capacity and cycle life of Li-Ion battery can be improved remarkably. Furthermore, after adding Conductive Nanotubes Composite additive, the tap density of battery electrode coatings can be increased by 10%.

This product can be used on anode and cathode of Lithium-Ion batteries with oil or water solvents. When using, dispersing equally the additive in pure solvent (Water or NMP), then add in binder materials and mix for about 2 hours. Then add active materials and mix for 4~6 hours. The appropriate quantity of additive is 2~3wt.% on cathode and 1~2wt.% on anode.

# Cheap Tubes

## Product Data Sheet: Carbon Nanotubes Additive for Li-Ion Applications



SEM image of Carbon Nanotubes Composite



SEM image of electrode added CNTC

Table 1 the test results of 700mAh053048 Li-ion battery, the cathode was prepared by  $\text{LiCoO}_2$  or  $\text{LiFePO}_4$ , and the anode was made with artificial graphite

		$\text{LiCoO}_2$		$\text{LiFePO}_4$	
		SP+KS-6	Multi-CNTs	SP+KS-6	Multi-CNTs
Tap Density ( $\text{g}/\text{cm}^3$ )		3.6	3.8	2.1	2.4
Cycle Life (1C/1C)	500cycles	75.3%	91.2%	89.2%	95.8%
	1000cycles	/	84.0%	83.1%	92.4%

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# Cheap Tubes

Property	Unit	Value
Tube Diameter ( $d_{50}$ )	nm	60~80
Tube Length	$\mu\text{m}$	10~15
BET Nitrogen Surface Area	$\text{m}^2/\text{g}$	55~75
Adsorption Value	$\text{ml}/100\text{g}$	500~550
Density (in the bag)	$\text{kg}/\text{m}^3$	120
Volume Resistivity	$\Omega \cdot \text{cm}$	$2\sim 5 \times 10^{-4}$
Moisture (as packed)	%	0.1~0.3
Ash Content	%	0.3 max
Ni	%	
Mg	%	
La	%	
Fe	%	
pH		8~9
Appearance	Black Powder	

The product can be used for the anodes and cathodes in Li-ion batteries, with oil or water solvent. To use, disperse the additive in pure solvent (water or NMP), then add in the binders and mix for about 2 hours. Next, add active materials and mix for 4~6 hours. The appropriate quantity of this additive is 2~3wt.% on cathode and 1~2wt.% on anode.

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