Shandong Carbon Search New Material Co., Ltd

Driving Innovation and Scale-Up in SWCNTs Manufacturing

CONTENT

- Corporate Overview
- Product Center
- Lithium Battery Applications
- Cooperation Discussion

Corporate Overview

Office & Workshops

Comprehensive Office Building



Phase Ⅰ Slurry Workshop



Phase Ⅱ Slurry Workshop



Phase Ⅰ Powder Workshop



Phase Ⅱ Powder Workshop



Phase Ⅲ Powder Workshop



Development Process



2020

Project establishment
at Shenzhen R&D Center

2023

Pilot line construction
Powder: KG level
Slurry: 500kg pilot line

2024

Mass production
Powder: 80T/year
Slurry: 1,300T/year

2025

Capacity Expansion
Powder: 80T+80T/year
Slurry: 13,000T/year

2026

Capacity Expansion
Powder: 160T+80T+ 80T/year
Slurry: 20,000T/year

2028

Capacity Expansion
Powder: 1,000T/year
Slurry: 100,000T/year



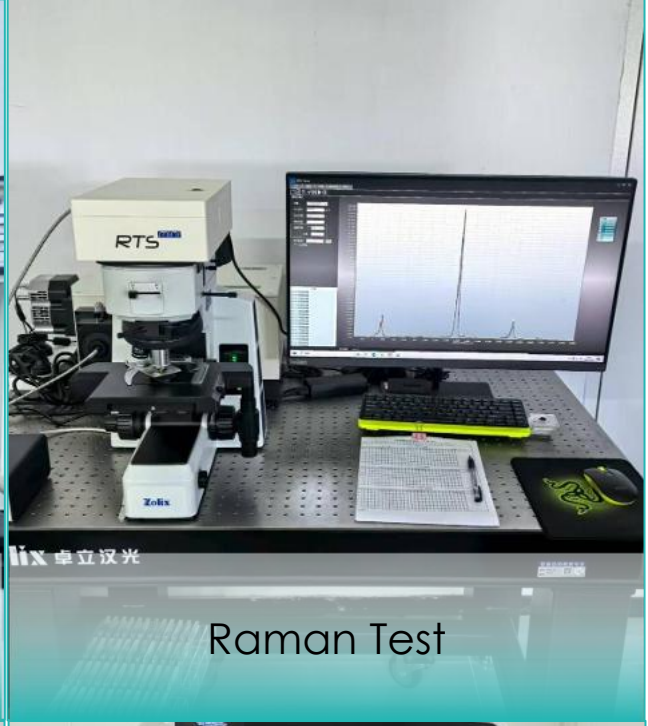
Testing Lab



ICP Test



SEM Test



Raman Test

TESTING CENTER



Metal Particle Test



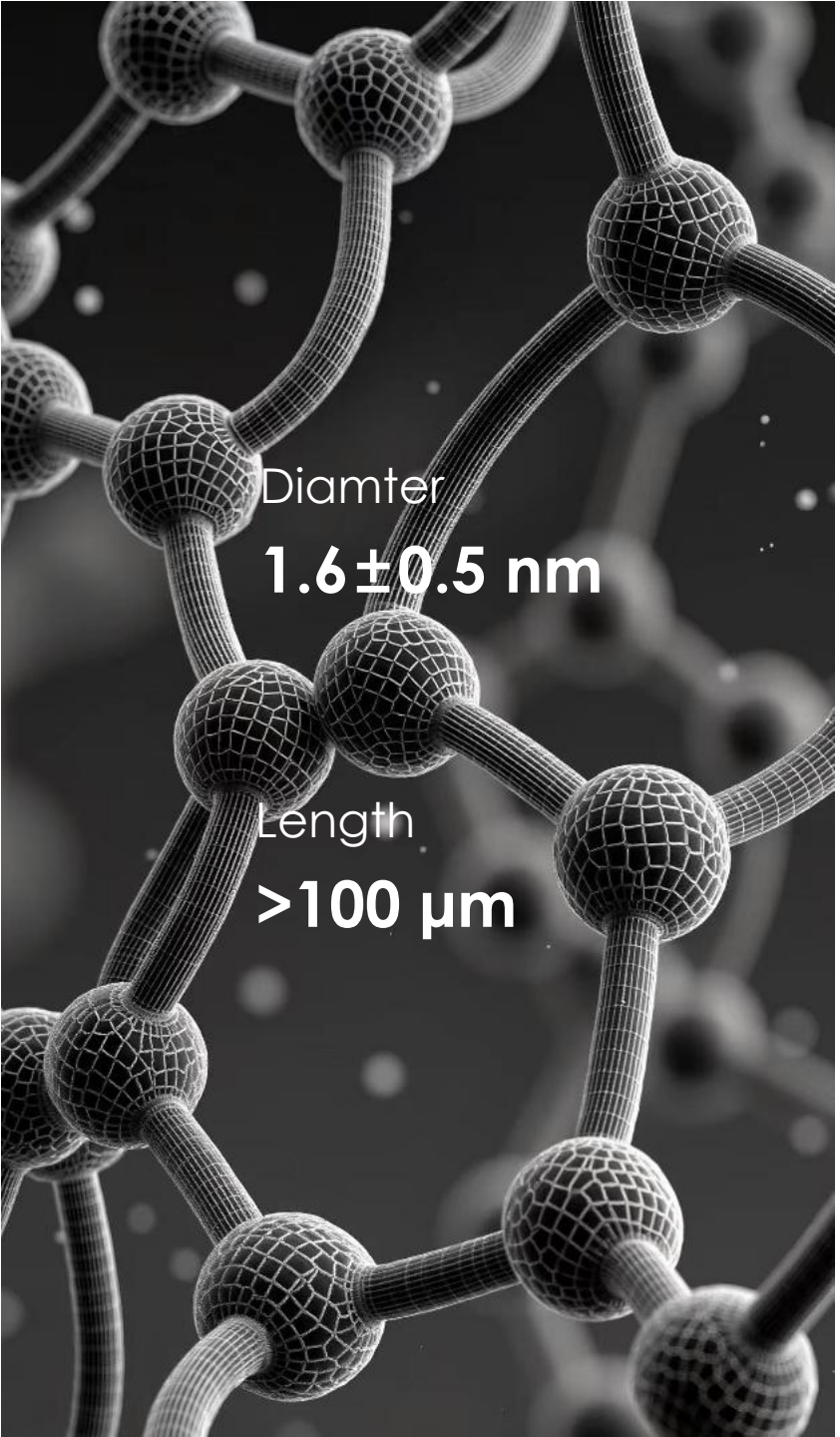
Coin Cell Test



Four-probe Test



BET Test



About SWCNTs

Single-walled carbon nanotubes **(SWCNTs**) are hollow, one- dimensional nanomaterials formed by rolling a single graphene layer. With diameters of 0.4–2 nm (about 1/10,000th of a human hair) and lengths up to micrometers or centimeters, they possess an extremely high aspect ratio.

Superior Performance

Superior conductive performance

Capable of handling current densities superior to copper

Exceptional strength

100 times stronger than steel

Remarkable flexibility

Based on their 1D configuration, exhibiting a high aspect ratio of 10^3–10^4

Excellent temperature resistance

Stable up to 1000°C in an inert atmosphere, and 400°C in air.

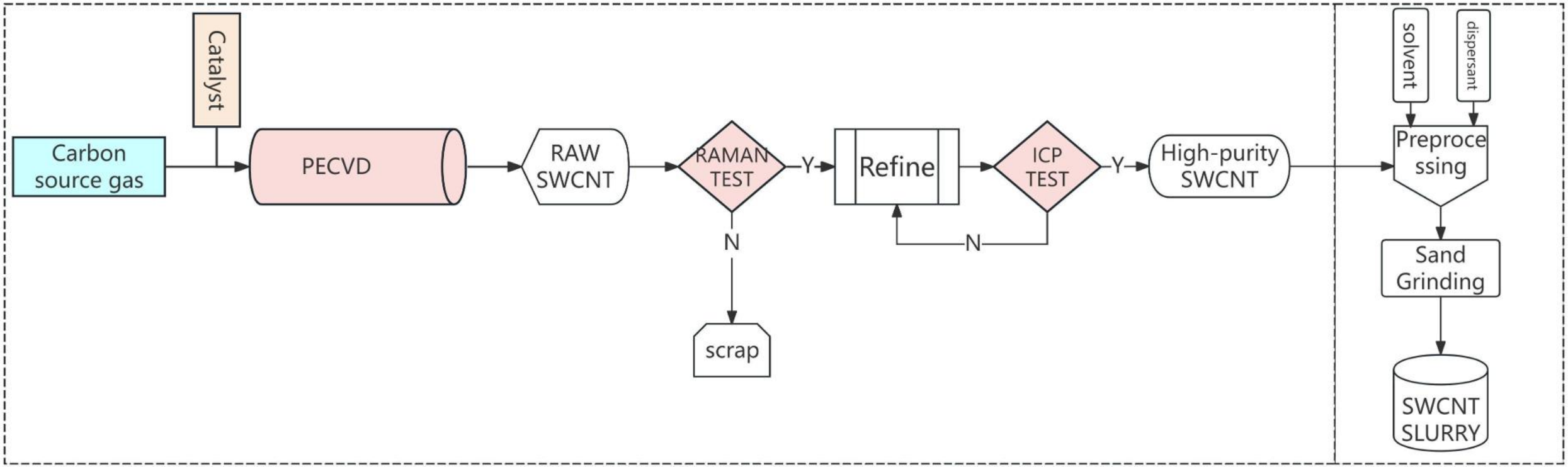
Extensive surface area

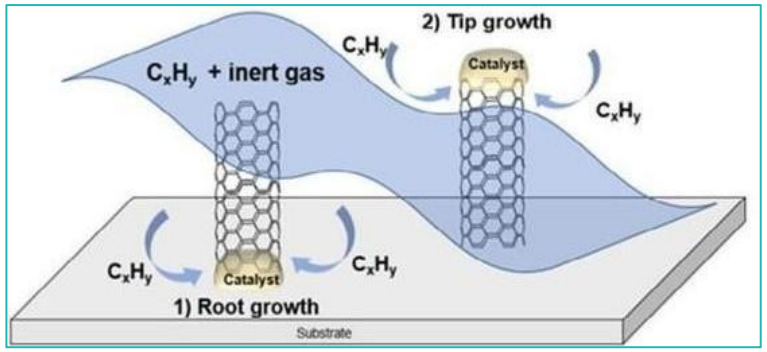
A high surface area of 1,200 m^2/g or greater

Premium-grade nanotubes

An exceptional G/D ratio reaching 120

Process Flow





Chemical Vapor Deposition (CVD):

Using nanoscale transition metals or their oxides as catalysts, carbon nanotubes are synthesized by pyrolyzing carbon source gases(such as methane, acetylene, ethylene, propylene, benzene, and carbon monoxide) at a relatively low temperature range of 500-1,200℃.

Product Roadmap

New Energy

Conductive Binder

Conductive Slurry

- Water-based
- NMP-based

Composite Polymer

Conductive Plastic

Antistatic Polymer Material

Thermal Management

SWCNT-Based TIM

SWCNT+Cu+Diamond

Functional Coating

Thermal Grease

Product Center

Main Products

SWCNT Powder



SWCNT Slurry





SWCNT Applications



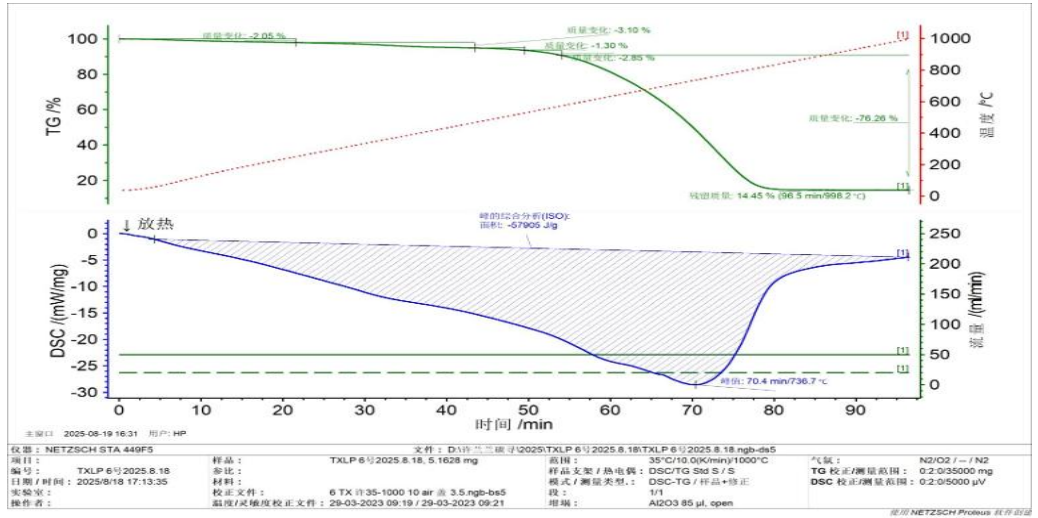


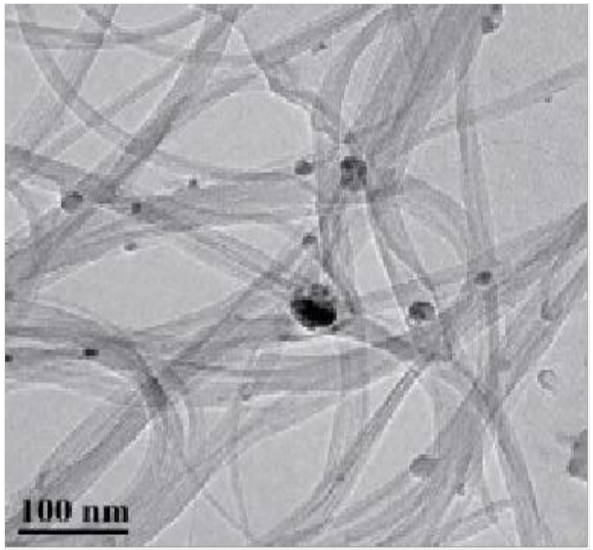




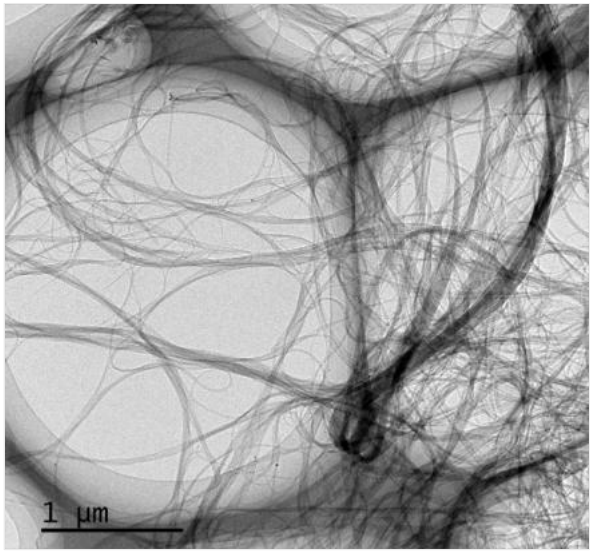
SWCNT Powder



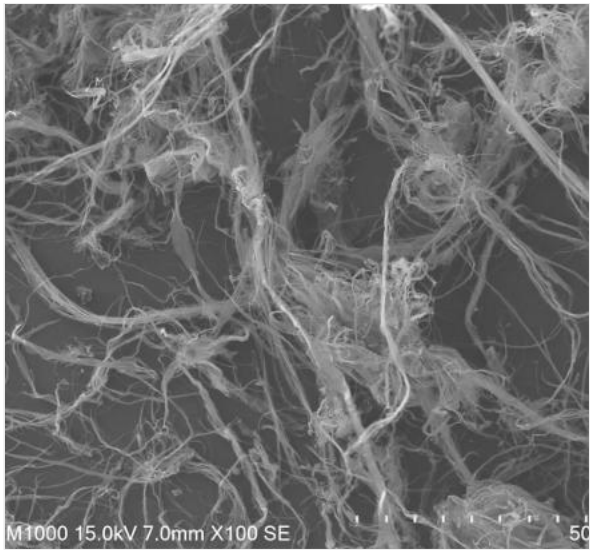




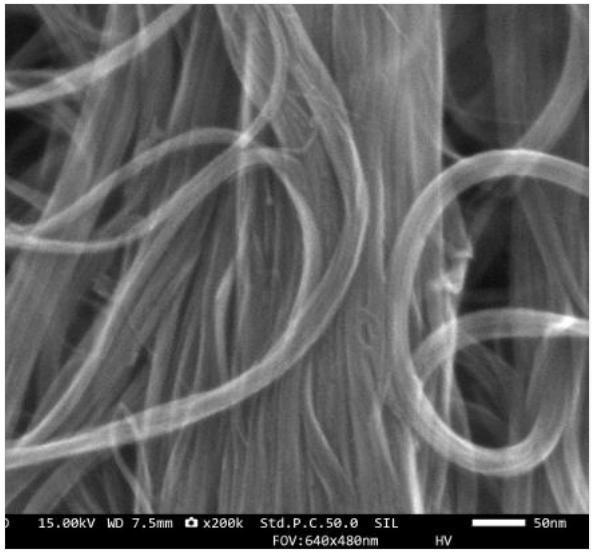
Low-purity SWCNTs



High-purity SWCNTs



High-purity SWCNTs via SEM



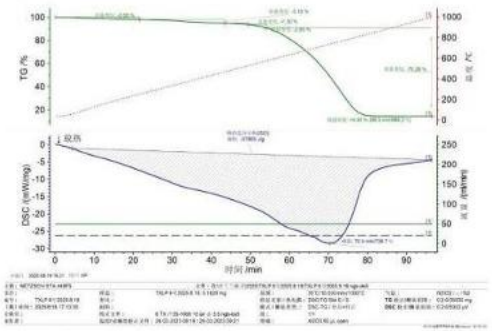
High-purity SWCNTs via SEM

Certificate of Analysis

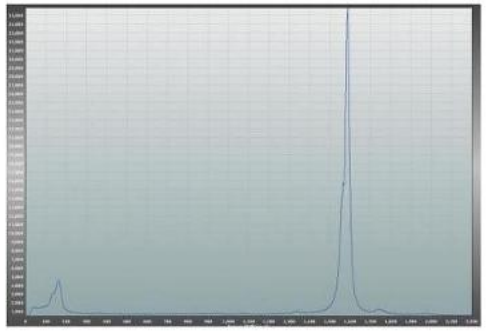
Characteristics:

Items	Units	Spec	Measured value	Methods
Appearance	–	Black powder	-	Visual Inspection
SWCNT content	wt%	>80	87.75	TGA
SWCNT length	μm	>100	>100	AFM
Specific surface area	m^2/g	400 - 1600	472	Quantachrome
SWCNT outer mean diameter	nm	1.6 ±0.5	1.6 ±0.5	Optical absorption: ISO/TS 10868:2017 (E)
G/D ratio	-	>50	95	Raman (532nm)
Metal impurities (Fe/Cr/Cu/Ni/Zn)	%	<15	12.25	Ash content
Moisture	%	<5	2	Infrared TGA

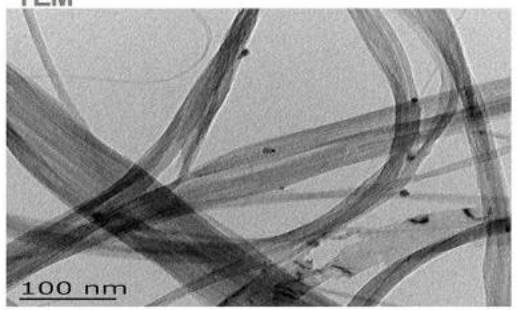
TGA

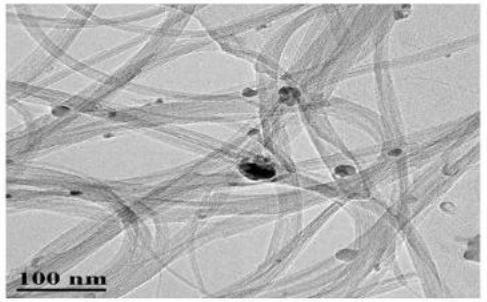


Raman



TEM

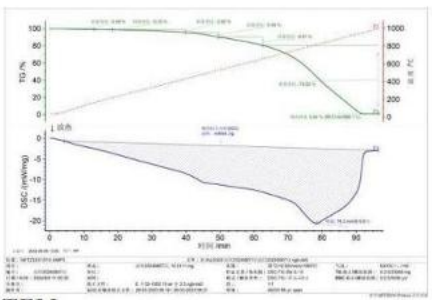




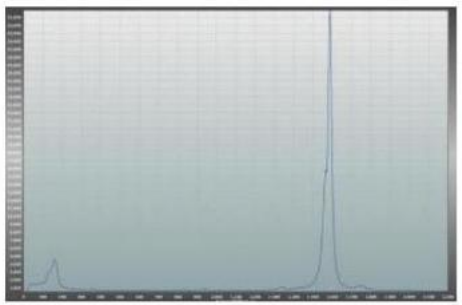
Characteristics:

Items	Units	Spec	measured value	Methods
Appearance	–	Black powder	-	Visual Inspection
SWCNT content	wt %	99 ±0.5	99.2	2 grams of powder 1000 degrees sufficient air condition for two hours, test residual ash (according to GB / T 36065-2018)
SWCNT length	μm	>100	>100	SEM
Specific surface area	m^2/g	600-1200	805	Quantachrome
SWCNT outer mean diameter	nm	1.4 ±0.5	1.4 ±0.5	Optical absorption: IS O/TS 10868:2017 (E)
G/D ratio	-	>50	62	Raman (532nm)
Metal impurities (Cr/Cu/Fe/Ni/Zn)	ppm	(<350/<20/<5000<350/<20)	0/0/3010/0/0	ICP-AES
Moisture	%	<5	3.79	TGA

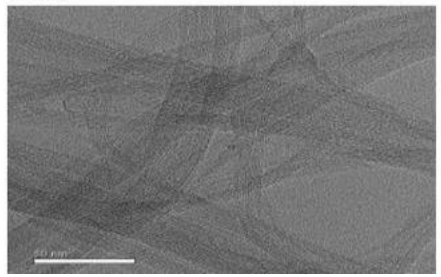
TGA

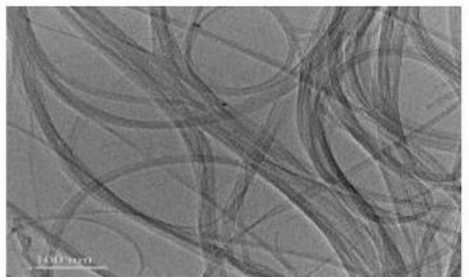


Raman



TEM





Certificate of Analysis

ingredient:

Single-walled carbon nanotube	0.40 wt.%
Dispersing agent	2.0 wt.%
NMP	97.6 wt.%

Measurement features:

Parameters	Univts	Specifications	Actual value	Method of evaluation
Appearance	–	black liquid	OK	Visual inspection
Solid content	*	2.16 - 2.64	2.472	Weight of dry residue
optical density	Absorbance units	0.4 - 0.6	0.416	spectrophotometer
Moisture	–	<800 ppm	370.6	Karl Fischer titration
Viscosity*	cPs	As received: 1500 - 4500 Upon arrival: 1500 - 4500	2216	Brookfield RVDV2T Rotor # 5 / 60 RPM
PH	/	5.0~9.0	7.45	SanLiangPH Instrument
Magnetic foreign (Cr/Cu/Fe/Mn/Ni/Zn)	ppb	-	(4.38/0.3/71.8/5.82/16.36/ /0.536)	ICP-AES
Metal impurities (Cr/Cu/Fe/Ni/Zn)	ppm	-	(0/0/15.7/0/0)	ICP-AES

* Single-walled carbon nanotube conductive slurry is a non-Newtonian fluid with both pseudoplastic and touch degeneration, that is, its viscosity depends on the shear rate (pseudoplastic) at the time of shear (touch degeneration). The change of touch is complex, switching between thichange and rheology under certain conditions.

ingredient:

single walled carbon nanotube	0.40 wt.%
Dispersing agent	0.60 wt.%
Deionized water	99wt.%

Measurement features:

parameters	Univts	specifications	Actual value	Method of evaluation
surface	–	black liquid	OK	Visual inspection
Solid content	%	1±0.1	1.019	Weight of dry residue
Optical density	Absorbance units	0.4 – 0.6	0.535	spectrophotometer
dynamic viscosity *	cP	leave the factory: 1500 - 5100 arrival of goods: 1500 - 5000	1607	Bolerfei, RV DV 2T Rotor # 5 / 60 RPM
PH	/	5.0~9.0	6.85	SanLiangPH Instrument
Magnetic foreign (Cr/Cu/Fe/Mn/Ni/Zn)	ppb	-	(0.75/0/37.7/0/ 0/0.857)	ICP-A ES
Metal impurities (Cr/Cu/Fe/Ni/Zn)	ppm	(<1/<1/<20/<1/<1)	(0/0/13/0/0)	ICP-A ES

* Single-walled carbon nanotube conductive slurry is a non-Newtonian fluid with both pseudoplastic and touch degeneration, that is, its viscosity depends on the shear rate (pseudoplastic) at the time of shear (touch degeneration). The change of touch is complex, switching between thichange and rheology under certain conditions.

SWCNT Slurry



NMP-based SWCNT Conductive Slurry	
SWCNTs	0.4wt.%
Dispersant	2.0wt.%
NMP	97.6wt.%



Water-based SWCNT Conductive Slurry	
SWCNTs	0.4wt.%
Dispersant	0.6wt.%
DI Water	99.0wt.%

SWCNT Concentrates

The pre-dispersed concentrated material independently developed and produced by Shandong Carbon Search,is designed to improve the electrical conductivity of epoxy resins.

Index	Measured values
Element	Fatty acid glycidyl ester
Density(g/cm³)	0.95
SWCNT Content(wt%)	10.20
Working dosage(wt%)	0.1-1%
Epoxy equivalent	261 – 271 g/mol

TX-E2 Specifications

Index	Measured values
Element	Ethoxylated alcohols
Density(g/cm³)	1.03
SWCNT Content(wt%)	10.45
Moisture(wt%)	0.94
Flash point(℃)	185

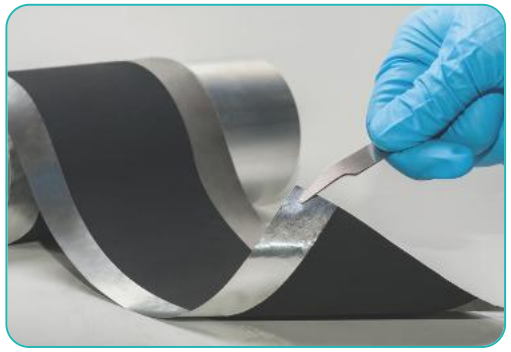
TX-E3 Specifications



With ultra-low dosage,our SWCNT concentrates provide excellent electrical conductivity while maintaining the final product's color, with minimal impact on the matrix's rheological and mechanical properties.

SWCNT Conductive Masterbatch

Carbon Search's SWCNT conductive masterbatch is produced by pre-dispersing SWCNT powder in a polymer carrier resin, yielding directly processable granules. This solves a key engineering bottleneck in SWCNT applications: the material's ultrafine particle size, strong agglomeration tendency, and poor dispersibility.



Dry electrode



ESD tools



ABS plastic



Conductive film



Semiconductor tray



FOUP vehicle



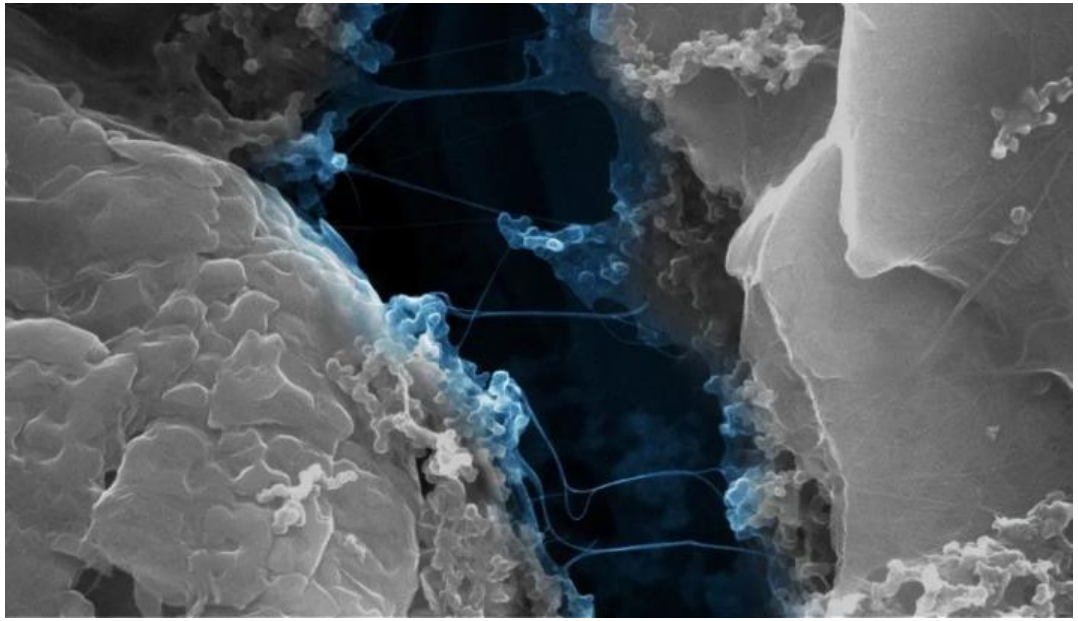
Smart wearables



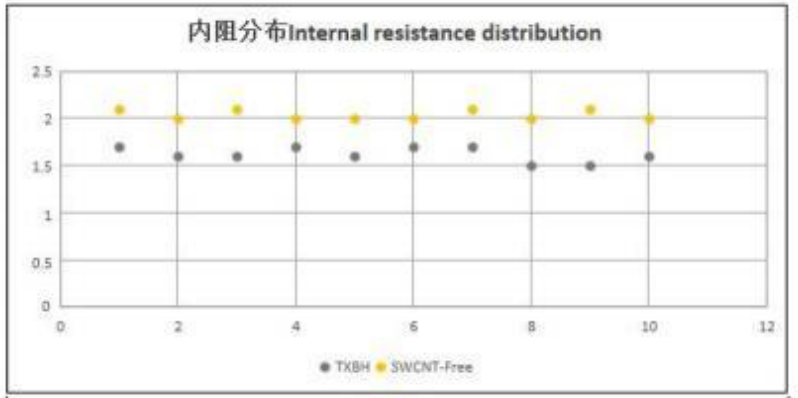
PE/PP powder

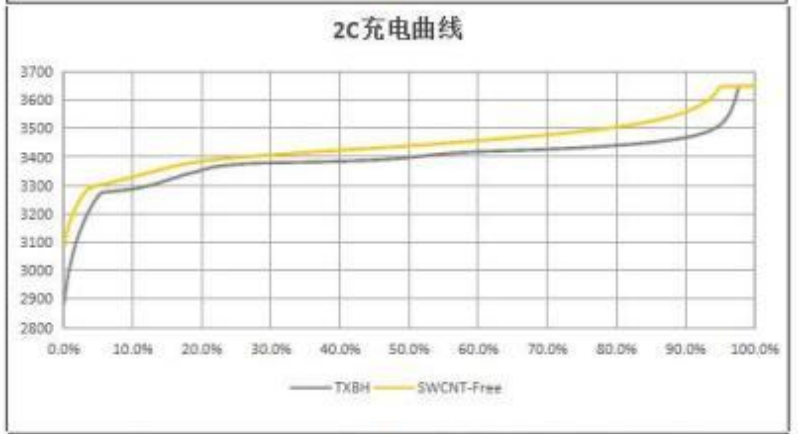
Lithium Battery Applications

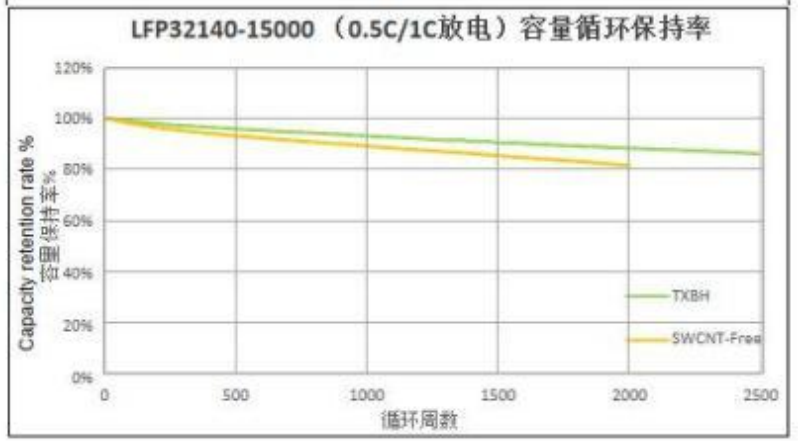
Cathode Fast-Charging Applications



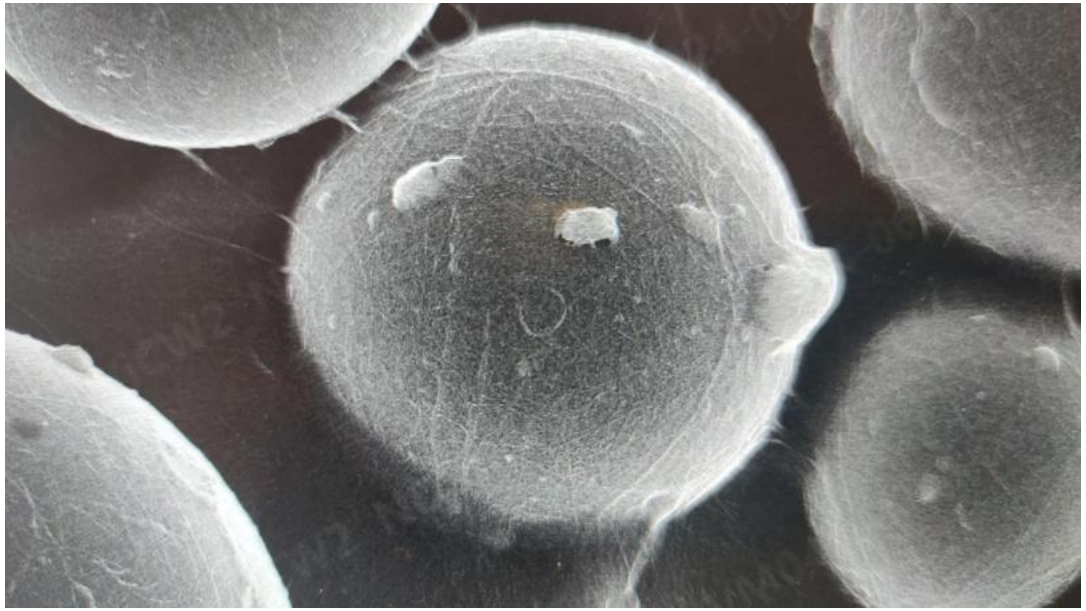
High-nickel cathodes suffer from low intrinsic conductivity (~10^{-4} S/cm). Unlike carbon black (**2–3%** loading), SWCNT requires only **0.2–0.5%** to build a 3D nano-wire conductive network, reducing resistance by **70%** and DCR growth by **50%**. It also buffers micro-cracking, suppresses capacity fade, and enhances 4C/6C fast-charging performance.





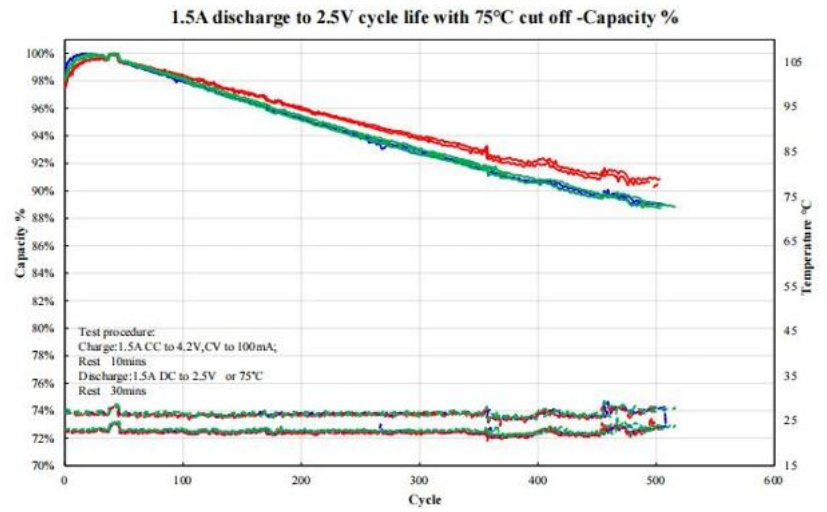


Silicon Anode Applications

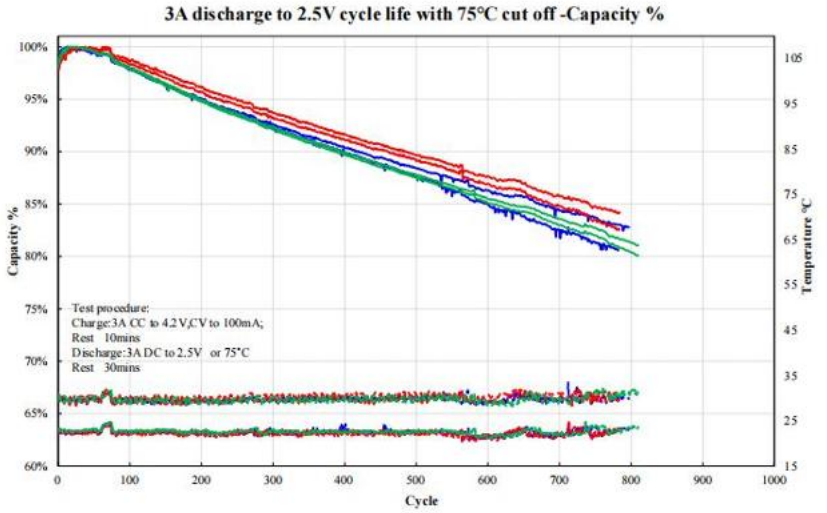


Silicon anodes are SWCNT's killer application. Despite 10x higher capacity than graphite, silicon expands **300–400%**, causing conventional conductive agents to fail. SWCNT's "nano-spring" structure anchors silicon particles, maintaining conductivity even at **400%** expansion, with **>90%** capacity retention over **700** cycles.

J194A- CNTs-TUBALL BATT J194B- TXBH J194C-

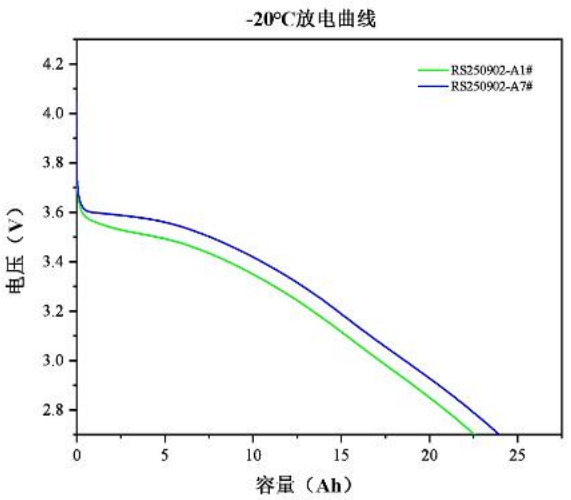


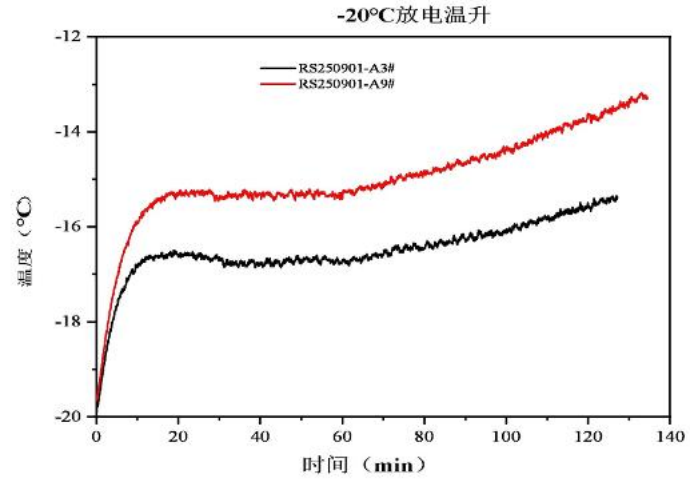
J194A- CNTs-TUBALL BATT J194B- TXBH J194C-



Solid-State Battery Applications

S/N	Item	Performance metrics	Group A (Control Group)	Group E (TX SWCNT)
1	Discharge capacity	>21.7Ah(0.5C)	22.1	22.3
2	Average voltage	>3.58V(0.5C)	3.585	3.586
3	Standard charging method	0.5C CC 4.25V CV 0.02C	0.5C CC 4.25V CV 0.02C	0.5C CC 4.25V CV 0.02C
4	Dimension	85*120*<10.6mm	10.6mm	10.6mm
5	Voltage range	2.75~4.25V	2.75~4.25V	2.75~4.25V
6	Discharge energy	>78Wh(0.5C)	79.2	79.4
7	Specific energy	335±5Wh/kg(0.5C)	337.2	340.3
8	Weight	<240g	235	234.1
9	AC internal resistance	<1.5mΩ	1.23	1.28
10	Rate capability and temperature rise	3C:>96%,~22℃(3C/0.5C)	96.3%,24.5℃	95.34%,21.9℃
		5C:>92%,~22℃(3C/0.5C)	94.66%,40.55℃	93.9%,38℃
11	Initial voltage drop at 3C discharge	>3.85V	3.88	3.89
12	Rate charge CC ratio and temperature rise	1C:>85%	90.38%	91.07%
		2C:>78%	79.16%	80.11%
13	DCR	Rdch:<4mΩ(5C/10s)	3.93	3.94
		Rdch:<4.5mΩ(3.75C/10s)	3.89	3.89
14	Peak discharge power	>600W	682	680
15	Peak charge power	>500W	575.4	575
16	-20℃ Discharge capacity retention	>88%(0.5C→2.24V)	92.10%	91.75%
17	55℃ Discharge capacity retention	>100%(0.5C)	103.52%	103.57%
18	55℃ High-temperature storage	Retention:>90%	93.25%	92.60%
		Recovery rate:>95%	97.11%	97.04%
		Gas evolution:<2.0mL	1.66	1.51
19	RT-1C/1C(100%DOD)	1C/1C-1000cycles-80%(2.75-4.25V)	96.18@232 cycles	95.56@232 cycles





Solid-state electrolytes are **non-flowable** with **poor ion pathways** and **high interfacial impedance**. SWCNT is essential as a tough conductive framework in both electrodes — at 3–5x the loading of liquid batteries. It forms conductive networks and buffers particle displacement in cathodes, and coats Si/C anodes to prevent expansion-induced disconnection.

Cooperation Discussion

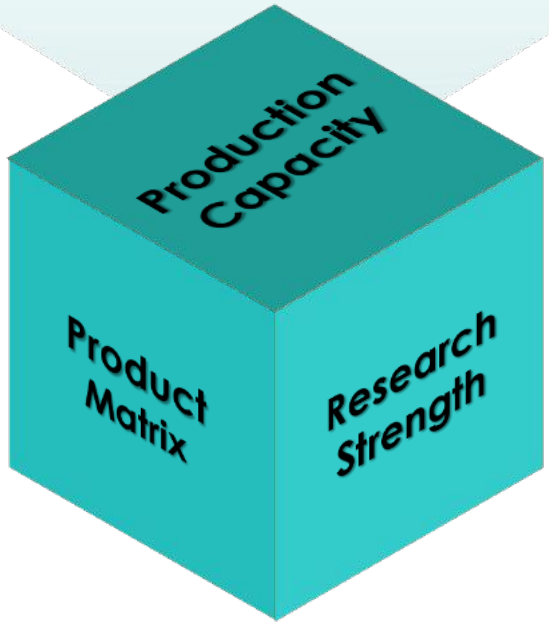
Why Carbon Search

Vast Production Capacity

We have the world's largest SWCNT powder and slurry production capacity, ensuring consistent, stable quality and one-stop solutions.

Diverse Product Matrix

We offer conductive slurries for lithium batteries, pre-dispersions and conductive masterbatches for polymers, and other extended applications.



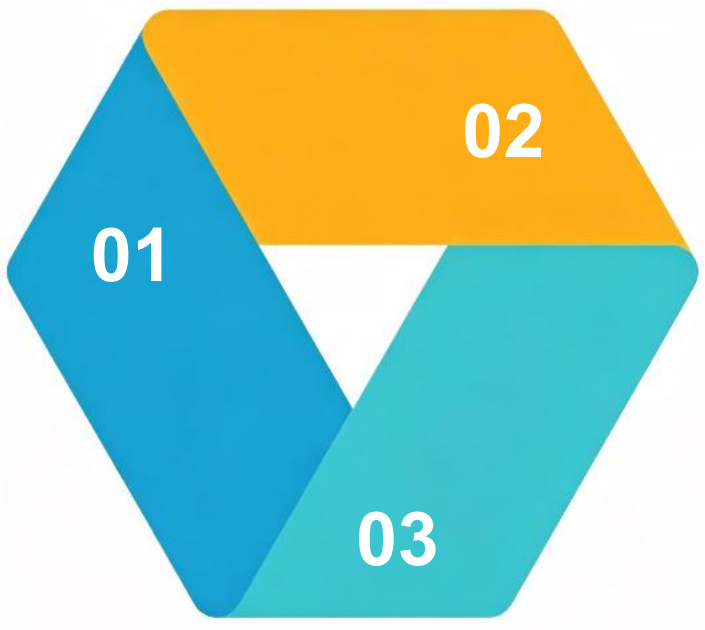
Deep R&D Foundation

Our group has dozens of scientists conducting R&D in battery and advanced materials, demonstrating strong R&D strength.

Cooperation Proposals

CNT Material Supplier

Having passed clients' supplier audit,Carbon Search is to become your direct or indirect supplier of nanotube conductive materials.



Distribution Partnership

Become Carbon Search's distributor in a specific market or segment, and we will support you in market development and sales.

Joint Development

For special product requirements or more cutting-edge R&D needs, our technical team will participate in joint development.

THANKS

www.t-xun.com