Carbon Nanotubes

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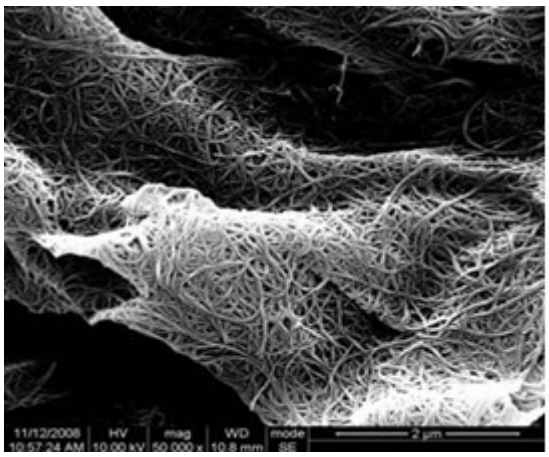
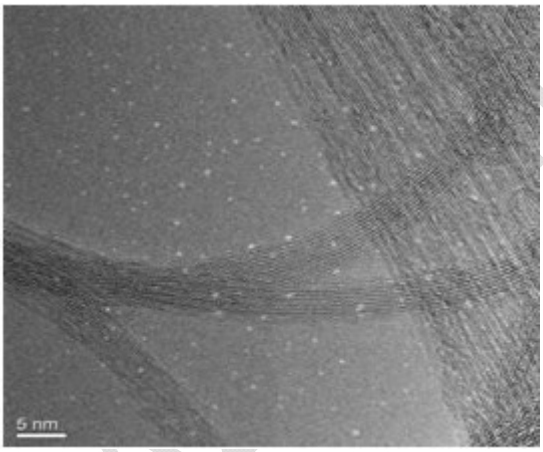
12.) Carbon Black
13.) Porous Carbon
14.) Activated Carbon
15.) Fullerenes

Single Walled Carbon Nanotubes

a. High Purity Single-walled Carbon Nanotubes





High Purity Single-walled Carbon Nanotubes. It is produced by methane catalytic decomposition over Co-based catalyst, then experienced deep air oxidation. There is almost no amorphous carbon in this product. It has high ignition temperature, and the temperature can often reach 620°C. It can be used to make transparent conductive films and other research & industrial application. This CNT-based Transparent Conductive Films can reach less than 200ohm/sq sheet resistance with more than 80% transparency.

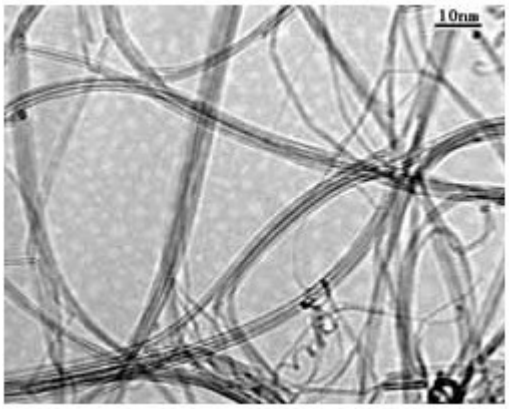
It is the ideal raw material for CNT-based Transparent Conductive Films for the touch screen, flat panel display, OLED, and thin-film solar industries. Compared with traditional indium tin oxide (ITO) coated films, the CNT-based transparent Conductive Films have the evidently superiority as follows:

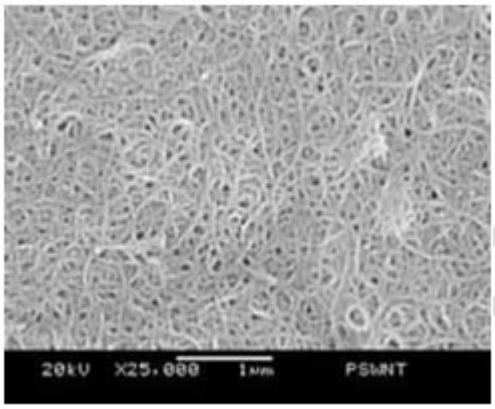
1.) More mechanical robustness for longer lifetime
2.) Broader and more color neutral transmittance
3.) Reaching higher levels of sheet resistance without losing uniformity
4.) Lower cost

We offer convenient quantities of CNT in packing of 1 to 500gram.

Property	**Unit**	**High Purity Single-walled Carbon Nanotubes**	**Method of Measurement**
		P/C: TN-COC-(NSR)TNST/2NM	
OD	nm	< 2	HRTEM, Raman
SWCNTs Purity	wt%	>95	TGA & TEM
Length	microns	5-30	TEM
SSA	m^2/g	>380	BET
ASH	wt%	< 5	HRTEM,TGA
EC	s/cm	>100	
Tap Density	g/cm^3	0.14	
Ignited Temperature	℃	610	TPO
I_g/I_d	--	>20	Raman
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area			

b. Purified Single-walled carbon nanotubes (SWCNT)

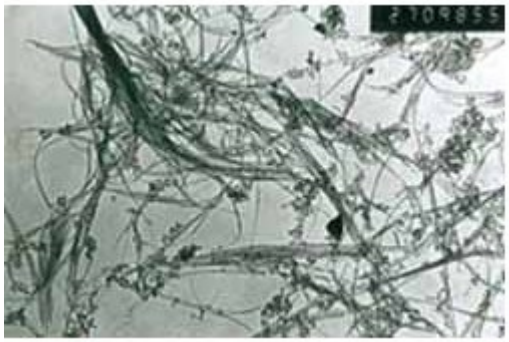


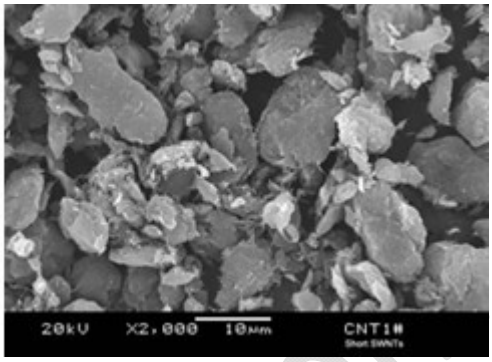


Purified Single-walled carbon nanotubes. There are three kinds of products: TN-COC-(NSR)TNS, TN-COC-(NSR)TNSH and TN-COC-(NSR)TNSC. -TNS is produced by methane decomposition over Co-based catalyst first, then experienced air oxidation to remove the amorphous carbon. -TNSH and -TNSC are -TNS hydroxyl and carboxyl derivates, respectively. They are produced by KMnO4 oxidation in H2SO4 solution at different temperature and KMnO4 concentration

Property	**Unit**	**SWCNTs**			**Method of Measurement**
		P/C: TN-COC-(NSR)TNS/1-2NM	***P/C: TN-COC-(NSR)TNSH/1-2NM***	***P/C: TN-COC-(NSR)TNSC/1-2NM***	
OD	nm	1-2	1-2	1-2	HRTEM, Raman
Purity	wt%	>90	>90	>90	TGA & TEM
Length	microns	5-30	5-30	5-30	TEM
SSA	m^2/g	>380	>380	>380	BET
ASH	wt%	<1.5	<1.5	<1.5	HRTEM,TGA
EC	s/cm	>100	>100	>100	
Tap Density	g/cm^3	0.14	0.14	0.14	
I_g/I_d	--	>9	>9	>9	Raman
-OH Functionalized	wt%		3.96		XPS & Titration
-COOH Functionalized	wt%			2.73	XPS & Titration
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area					

c. Short Purified Single-walled carbon nanotubes (SWCNT)

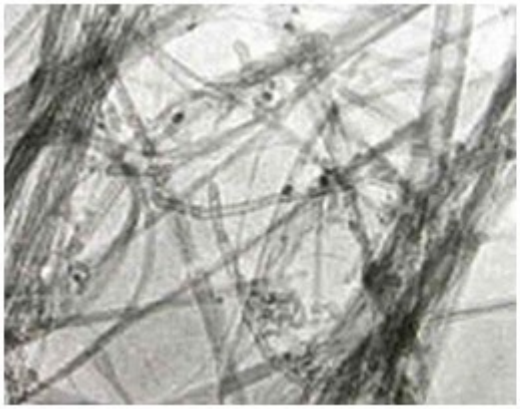


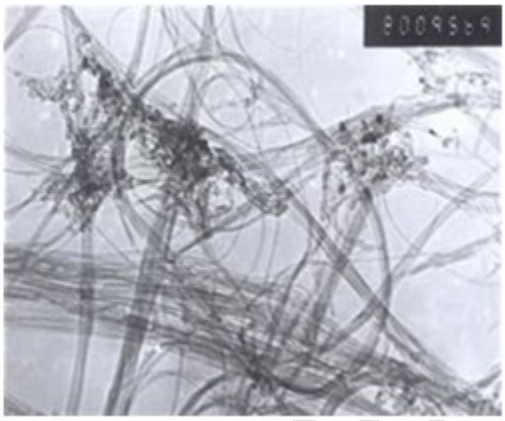


Short purified Single-walled carbon nanotubes. There are three kinds of products in this catalog: TN-COC-(NSR)TNSS, TN-COC-(NSR)TNSSH and TN-COC-(NSR)TNSSC. -TNSS is produced by mechanical cutting purified single-walled carbon nanotubes, then experienced dis-agglomeration operation. -TNSSH and -TNSSC are TNSS hydroxyl and carboxyl derivates, respectively. They are produced by KMnO4 oxidation in H2SO4 solution at different temperature and KMnO4 concentration.

Property	**Unit**	**Short-Length SWCNTs**			**Method of Measurement**
		P/C: TN-COC-(NSR)TNSS/1-2NM	***P/C: TN-COC-(NSR)TNSSH/1-2NM***	***P/C: TN-COC-(NSR)TNSSC/1-2NM***	
OD	nm	1-2	1-2	1-2	HRTEM, Raman
Purity	wt%	>90	>90	>90	TGA & TEM
Length	microns	1-3	0.5-2	0.5-2	TEM
SSA	m^2/g	>380	>380	>380	BET
ASH	wt%	<1.5	<1.5	<1.5	HRTEM,TGA
EC	s/cm	>100	>100	>100	
Tap Density	g/cm^3	0.14	0.14	0.14	
I_g/I_d	--	>9	>9	>9	Raman
-OH Functionalized	wt%		3.96		XPS & Titration
-COOH Functionalized	wt%			2.73	XPS & Titration
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area					

d. Industrial Single-walled carbon nanotubes (ISWCNT)



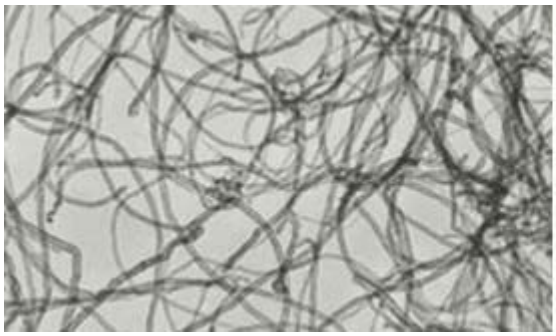


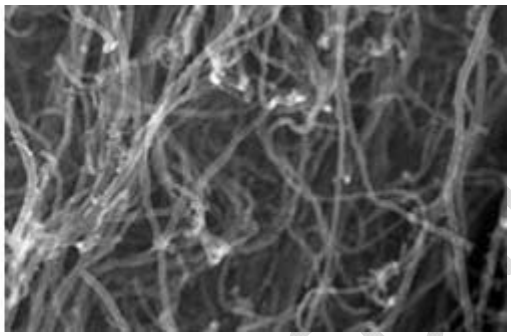
Industrial Single-walled carbon nanotubes. There are three kinds of products in this catalog: TN-COC(NSR)TNIS, TN-COC-(NSR)TNISH and TN-COC-(NSR)TNISC. -TNIS is produced by methane decomposition over Co-based catalyst first, then experienced air oxidation to remove the amorphous carbon. -TNISH and -TNISC are -TNS hydroxyl and carboxyl derivates, respectively. They are produced by KMnO4 oxidation in H2SO4 solution at different temperature and KMnO4 concentration

Property	Unit	SWCNTs			Method of Measurement
		P/C: TN-COC-(NSR)TNIS/1-2NM	***P/C: TN-COC-(NSR)TNISH/1-2NM***	***P/C: TN-COC-(NSR)TNISC/1-2NM***	
OD	nm	1-2	1-2	1-2	HRTEM, Raman
Purity	wt%	>60	>60	>60	TGA & TEM
Length	microns	5-30	5-30	5-30	TEM
SSA	m^2/g	>407	>407	>407	BET
ASH	wt%	<1.5	<1.5	<1.5	HRTEM,TGA
EC	s/cm	>100	>100	>100	
Tap Density	g/cm^3	0.14	0.14	0.14	
I_g/I_d	--	--	--	--	Raman
-OH Functionalized	wt%		3.96		XPS & Titration
-COOH Functionalized	wt%			2.73	XPS & Titration
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area					

Multi Walled Carbon Nanotubes

1) a. Purified Multi-walled carbon nanotubes

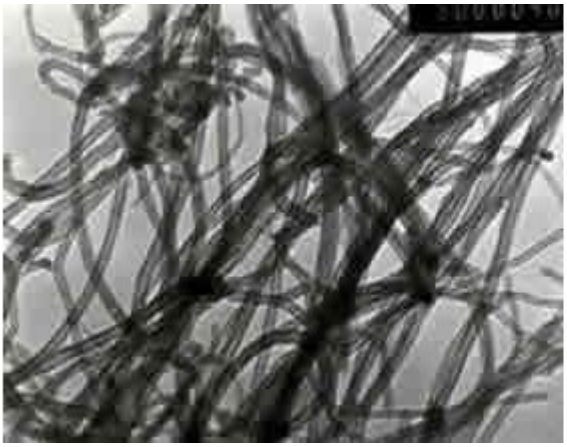


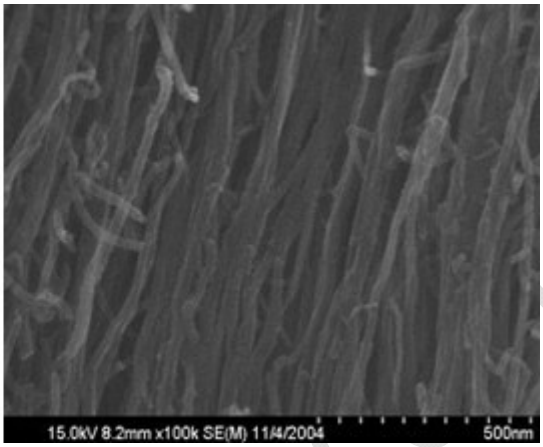


Purified Multi-walled carbon nanotubes. There are three kinds of products in this catalog: TN-COC-(NSR)TNM1, TN-COC-(NSR)TNMH1 and TN-COC-(NSR)TNMC1. -TNM1 is produced by natural gas catalytic decomposition over Co-based catalyst. -TNMH1 and -TNMC1 are -TNM1 hydroxyl and carboxyl derivates, respectively. They are produced by KMnO4 oxidation in H2SO4 solution at different temperature and KMnO4 concentration.

Property	**Unit**	**MWCNTs**			**Method of Measurement**
		P/C: TN-COC-(NSR)TNM1/8NM	***P/C: TN-COC-(NSR)TNMH1/8NM***	***P/C: TN-COC-(NSR)TNMC1/8NM***	
OD	Nm	<8	<8	<8	HRTEM, Raman
Purity	wt%	>95	>95	>95	TGA & TEM
Length	microns	10-30	10-30	10-30	TEM
SSA	m^2/g	>500	>500	>500	BET
ASH	wt%	<1.5	<1.5	<1.5	TGA
EC	s/cm	>100	>100	>100	
Tap Density	g/cm^3	0.27	0.27	0.27	
I_g/I_d	--	--	--	--	Raman
-OH Content	wt%		5.58		XPS & Titration
-COOH Content	wt%			3.86	XPS & Titration
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area					

b. Purified Multi-walled carbon nanotubes

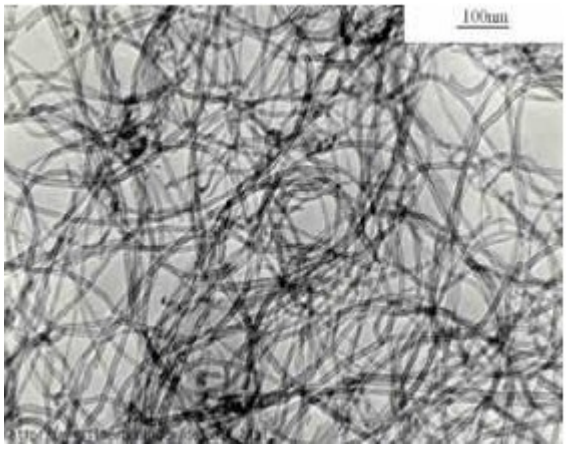


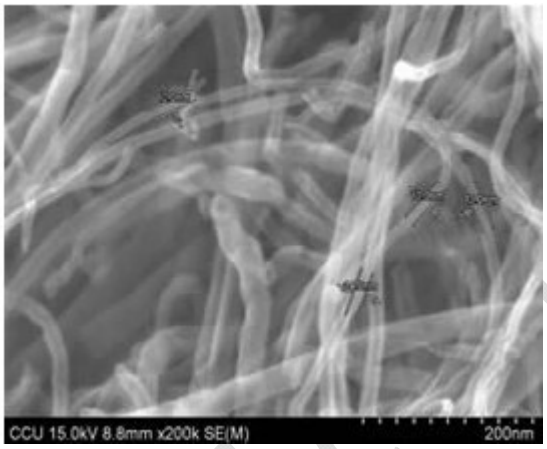


Purified Multi-walled carbon nanotubes. There are three kinds of products in this catalog: TN-COC-(NSR)TNM2,-TN-COC-(NSR)TNMH2 and TN-COC-(NSR)TNMC2. -TNM2 is produced by acetylene catalytic decomposition over Ni-based catalyst. -TNM2 often exists in bundles. -TNMH2 and -TNMC2 are -TNM2 hydroxyl and carboxyl derivates, respectively. They are produced by $KMnO_4$ oxidation in H_2SO_4 solution at different temperature and $KMnO_4$ concentration.

Property	**Unit**	**MWCNTs**			**Method of Measurement**
		P/C: TN-COC-(NSR)TNM2/8-15NM	***P/C: TN-COC-(NSR)TNMH2/8-15NM***	***P/C: TN-COC-(NSR)TNMC2/8-15NM***	
OD	nm	8-15	8-15	8-15	HRTEM, Raman
Purity	wt%	>95	>95	>95	TGA & TEM
Length	microns	~50	~50	~50	TEM
SSA	m^2/g	>233	>233	>233	BET
ASH	wt%	<1.5	<1.5	<1.5	TGA
EC	s/cm	>100	>100	>100	
Tap Density	g/cm^3	0.27	0.27	0.27	
I_g/I_d	--	--	--	--	Raman
-OH Content	wt%		5.58		XPS & Titration
-COOH Content	wt%			2.56	XPS & Titration
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area					

c. Purified Multi-walled carbon nanotubes

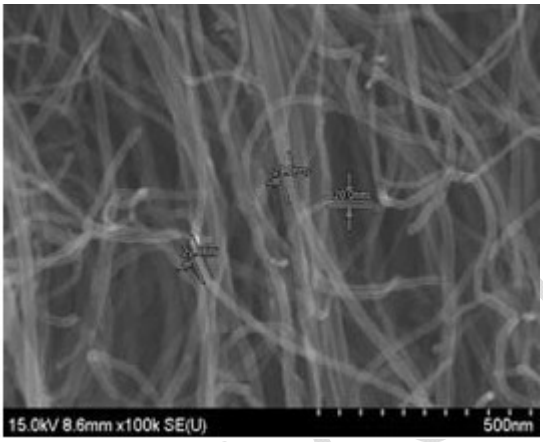




Purified Multi-walled carbon nanotubes. There are three kinds of products in this catalog: TN-COC-(NSR)TNM3, TN-COC-(NSR)TNMH3 and TN-COC-(NSR)TNMC3. -TNM3 is produced by natural gas catalytic decomposition over Ni-based catalyst. -TNMH3 and -TNMC3 are -TNM3 hydroxyl and carboxyl derivates, respectively. They are produced by $KMnO_4$ oxidation in H_2SO_4 solution at different temperature and $KMnO_4$concentration.

Property	**Unit**	**MWCNTs**			**Method of Measurement**
		P/C: TN-COC-(NSR)TNM3/10-20NM	***P/C: TN-COC-(NSR)TNMH3/10-20NM***	***P/C: TN-COC-(NSR)TNMC3/10-20NM***	
OD	nm	10-20	10-20	10-20	HRTEM, Raman
Purity	wt%	>95	>95	>95	TGA & TEM
Length	microns	10-30	10-30	10-30	TEM
SSA	m^2/g	>200	>200	>200	BET
ASH	wt%	<1.5	<1.5	<1.5	TGA
EC	s/cm	>100	>100	>100	
Tap Density	g/cm^3	0.22	0.22	0.22	
I_g/I_d	--	--	--	--	Raman
-OH Content	wt%		3.06		XPS & Titration
-COOH Content	wt%			2.00	XPS & Titration
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area					

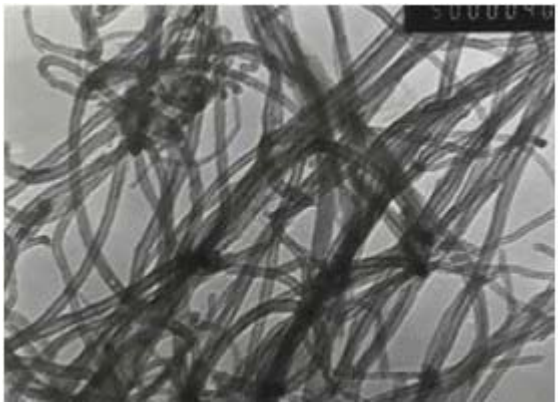
d. Purified Multi-walled carbon nanotubes

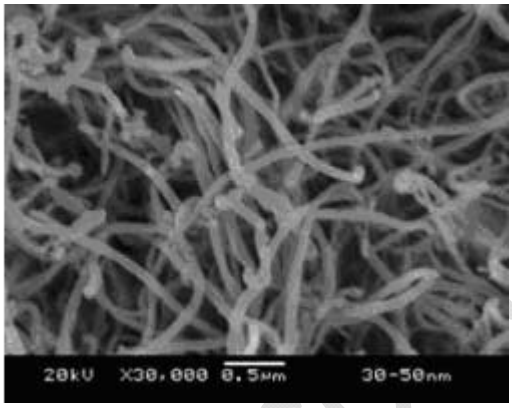


Purified Multi-walled carbon nanotubes. There are three kinds of products in this catalog: TN-COC-(NSR)TNM5, TN-COC-(NSR)TNMH5 and TN-COC-(NSR)TNMC5. -TNM5 is produced by natural gas catalytic decomposition over Ni-based catalyst. -TNMH5 and -TNMC5 are -TNM5 hydroxyl and carboxyl derivates, respectively. They are produced by $KMnO_4$ oxidation in H_2SO_4 solution at different temperature and $KMnO_4$concentration.

Property	Unit	MWCNTs			Method of Measurement
		P/C: TN-COC-(NSR)TNM5/20-30NM	***P/C: TN-COC-(NSR)TNMH5/20-30NM***	***P/C: TN-COC-(NSR)TNMC5/20-30NM***	
OD	**nm**	20-30	20-30	20-30	HRTEM, Raman
Purity	**wt%**	>95	>95	>95	TGA & TEM
Length	**microns**	10-30	10-30	10-30	TEM
SSA	**m^2/g**	>110	>110	>110	BET
ASH	**wt%**	<1.5	<1.5	<1.5	TGA
EC	**s/cm**	>100	>100	>100	
Tap Density	**g/cm^3**	0.28	0.28	0.28	
I_g/I_d	**--**	--	--	--	Raman
-OH Content	**wt%**		1.76		XPS & Titration
-COOH Content	**wt%**			1.23	XPS & Titration
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area					

e. Purified Multi-walled carbon nanotubes

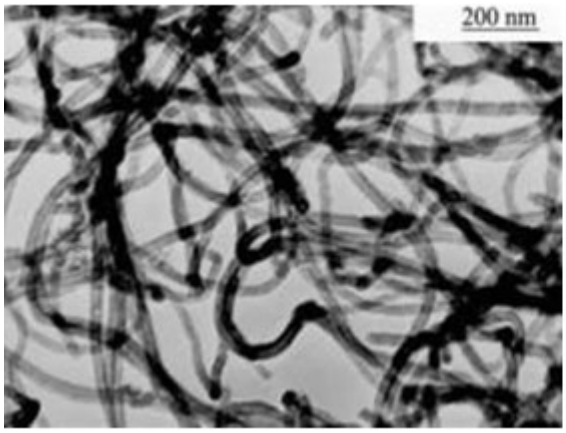


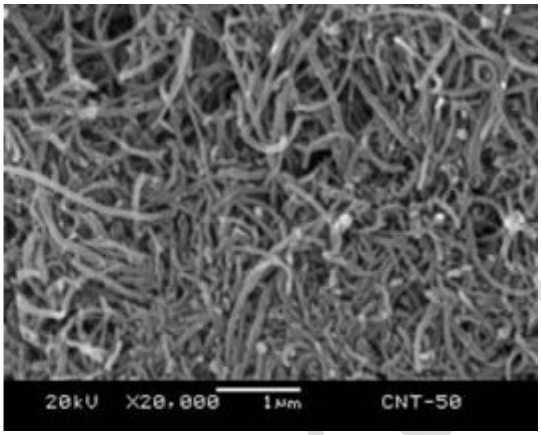


Purified Multi-walled carbon nanotubes. There are three kinds of products in this catalog: TN-COC-(NSR)TNM7, TN-COC-(NSR)TNMH7 and TN-COC-(NSR)TNMC7. -TNM7 is produced by natural gas catalytic decomposition over Ni-based catalyst. - TNMH7 and -TNMC7 are -TNM7 hydroxyl and carboxyl derivates, respectively. They are produced by $KMnO_4$ oxidation in H_2SO_4 solution at different temperature and $KMnO_4$concentration.

Property	**Unit**	**MWCNTs**			**Method of Measurement**
		P/C: TN-COC-(NSR)TNM7/30-50NM	***P/C: TN-COC-(NSR)TNMH7/30-50NM***	***P/C: TN-COC-(NSR)TNMC7/30-50NM***	
OD	nm	30-50	30-50	30-50	HRTEM, Raman
Purity	wt%	>95	>95	>95	TGA & TEM
Length	microns	10-20	10-20	10-20	TEM
SSA	m^2/g	>60	>60	>60	BET
ASH	wt%	<1.5	<1.5	<1.5	TGA
EC	s/cm	>100	>100	>100	
Tap Density	g/cm^3	0.22	0.22	0.22	
I_g/I_d	--	--	--	--	Raman
-OH Content	wt%		1.06		XPS & Titration
-COOH Content	wt%			0.73	XPS & Titration
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area					

f. Purified Multi-walled carbon nanotubes

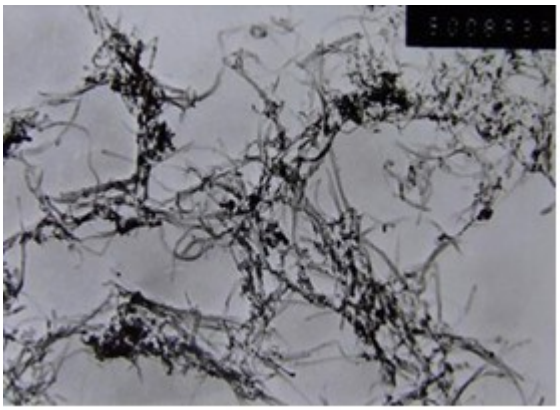


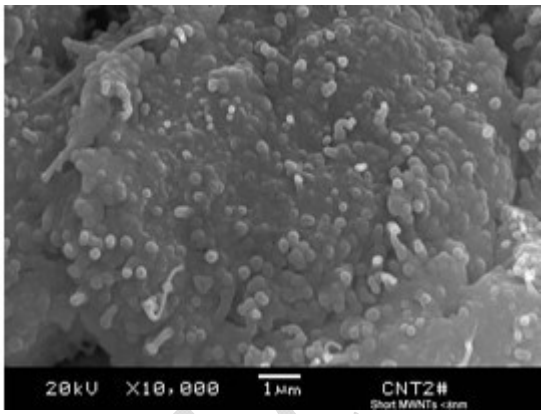


Purified Multi-walled carbon nanotubes. There are three kinds of products in this catalog: TN-COC-(NSR)TNM8, TN-COC-(NSR)TNMH8 and TN-COC-(NSR)TNMC8. -TNM8 is produced by natural gas catalytic decomposition over Ni-based catalyst. -TNMH8 and -TNMC8 are -TNM8 hydroxyl and carboxyl derivates, respectively. They are produced by $KMnO_4$ oxidation in H_2SO_4 solution at different temperature and $KMnO_4$concentration.

Property	**Unit**	**MWCNTs**			**Method of Measurement**
		P/C: TN-COC-(NSR)TNM8/50NM	***P/C: TN-COC-(NSR)TNMH8/50NM***	***P/C: TN-COC-(NSR)TNMC8/50NM***	
OD	nm	>50	>50	>50	HRTEM, Raman
Purity	wt%	>95	>95	>95	TGA & TEM
Length	microns	10-20	10-20	10-20	TEM
SSA	m^2/g	>40	>40	>40	BET
ASH	wt%	<1.5	<1.5	<1.5	TGA
EC	s/cm	>100	>100	>100	
Tap Density	g/cm^3	0.18	0.18	0.18	
I_g/I_d	--	--	--	--	Raman
-OH Content	wt%		0.71		XPS & Titration
-COOH Content	wt%			0.49	XPS & Titration
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area					

2) a. Short-length Multi-walled carbon nanotubes (MWCNT)

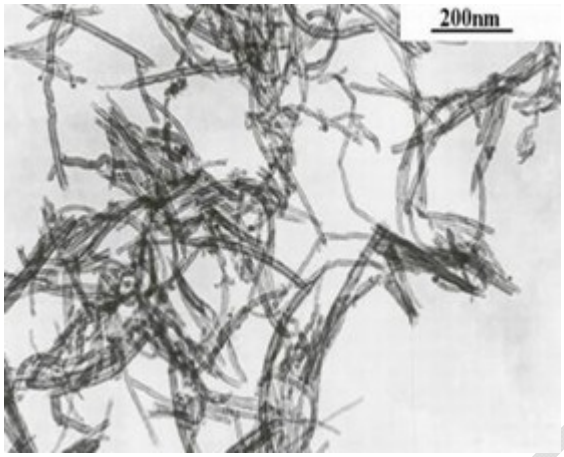




Short-length High purity Multi-walled carbon nanotubes. have three kinds of products: TN-COC-(NSR)TNSM1, TN-COC-(NSR)TNSMH1 and TN-COC-(NSR)TNSMC1. -TNSM1 is produced by mechanical cutting -TNM1, followed by dis-agglomeration treatment. -TNSMH1 and -TNSMC1 are the -TNSM1 hydroxyl and carboxyl functionalized products, respectively. -TNSMH1 and -TNSMC1 are prepared by KMnO4 oxidation in H2SO4 solution at different temperature and different KMnO4 concentration.

Property	**Unit**	**Short-Length MWCNTs**			**Method of Measurement**
		P/C: TN-COC-(NSR)TNSM1/8NM	***P/C: TN-COC-(NSR)TNSMH1/8NM***	***P/C: TN-COC-(NSR)TNSMC1/8NM***	
OD	nm	<8	<8	<8	HRTEM, Raman
Purity	wt%	>95	>95	>95	TGA & TEM
Length	microns	0.5-2	0.5-2	0.5-2	TEM
SSA	m^2/g	>500	>500	>500	BET
ASH	wt%	<1.5	<1.5	<1.5	TGA
EC	s/cm	>100	>100	>100	
Tap Density	g/cm^3	0.27	0.27	0.27	
I_g/I_d	--	--	--	--	Raman
-OH Content	wt%		5.58		XPS & Titration
-COOH Content	wt%			3.86	XPS & Titration
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area					

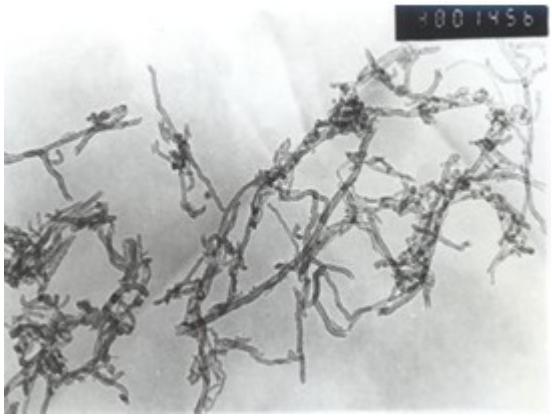
b. Short-length Multi-walled carbon nanotubes (MWCNT)



Short-length High purity Multi-walled carbon nanotubes. Have three kinds of products: TN-COC-(NSR)TNSM2, TN-COC-(NSR)TNSMH2 and TN-COC-(NSR)TNSMC2.
-TNSM2 is produced by mechanical cutting -TNM2, followed by dis-agglomeration treatment. -TNSMH2 and -TNSMC2 are the -TNSM2 hydroxyl and carboxyl functionalized products, respectively. -TNSMH2 and -TNSMC2 are prepared by $KMnO_4$ oxidation in H_2SO_4solution at different temperature and different $KMnO_4$ concentration.

Property	**Unit**	**Short-Length MWCNTs**			**Method of Measurement**
		P/C: TN-COC-(NSR)TNSM2/8-15NM	***P/C: TN-COC-(NSR)TNSMH2/8-15NM***	***P/C: TN-COC-(NSR)TNSMC2/8-15NM***	
OD	nm	8-15	8-15	8-15	HRTEM, Raman
Purity	wt%	>95	>95	>95	TGA & TEM
Length	microns	0.5-2	0.5-2	0.5-2	TEM
SSA	m^2/g	>233	>233	>233	BET
ASH	wt%	<1.5	<1.5	<1.5	TGA
EC	s/cm	>100	>100	>100	
Tap Density	g/cm^3	0.27	0.27	0.27	
I_g/I_d	--	--	--	--	Raman
-OH Content	wt%		5.58		XPS & Titration
-COOH Content	wt%			2.56	XPS & Titration
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area					

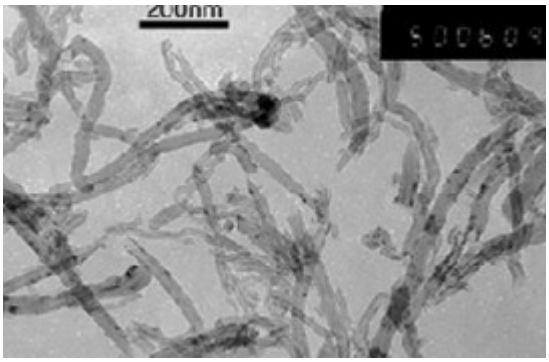
c. Short-length Multi-walled carbon nanotubes (MWCNT)



Short-length High purity Multi-walled carbon nanotubes. Have three kinds of products: TN-COC-(NSR)TNSM3, TN-COC-(NSR)TNSMH3 and TN-COC-(NSR)TNSMC3.
-TNSM3 is produced by mechanical cutting -TNM3, followed by dis-agglomeration treatment. -TNSMH3 and -TNSMC3 are the -TNSM3 hydroxyl and carboxyl functionalized products, respectively. -TNSMH3 and -TNSMC3 are prepared by $KMnO_4$ oxidation in H_2SO_4solution at different temperature and different $KMnO_4$ concentration.

Property	**Unit**	**Short-Length MWCNTs**			**Method of Measurement**
		P/C: TN-COC-(NSR)TNSM3/10-20NM	***P/C: TN-COC-(NSR)TNSMH3/10-20NM***	***P/C: TN-COC-(NSR)TNSMC3/10-20NM***	
OD	nm	10-20	10-20	10-20	HRTEM, Raman
Purity	wt%	>95	>95	>95	TGA & TEM
Length	microns	0.5-2	0.5-2	0.5-2	TEM
SSA	m^2/g	>200	>200	>200	BET
ASH	wt%	<1.5	<1.5	<1.5	TGA
EC	s/cm	>100	>100	>100	
Tap Density	g/cm^3	0.22	0.22	0.22	
I_g/I_d	--	--	--	--	Raman
-OH Content	wt%		3.06		XPS & Titration
-COOH Content	wt%			2.00	XPS & Titration
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area					

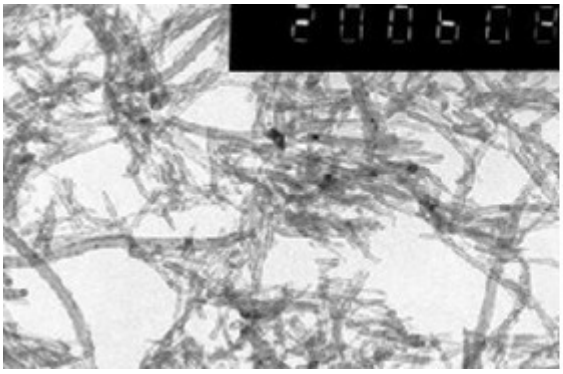
d. Short-length Multi-walled carbon nanotubes (MWCNT)

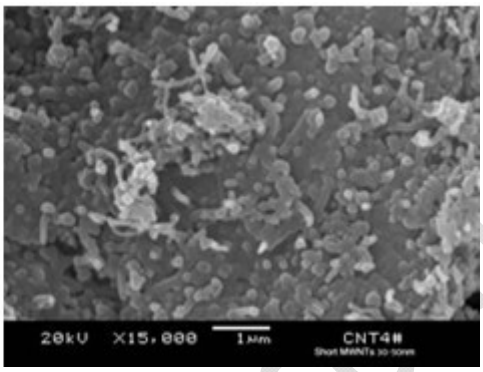


Short-length High purity Multi-walled carbon nanotubes. Have three kinds of products: TN-COC-(NSR0TNSM5, TN-COC-(NSR)TNSMH5 and TN-COC-(NSR)TNSMC5.
-TNSM5 is produced by mechanical cutting -TNM5, followed by dis-agglomeration treatment. -TNSMH5 and -TNSMC5 are the -TNSM5 hydroxyl and carboxyl functionalized products, respectively.- TNSMH5 and -TNSMC5 are prepared by $KMnO_4$ oxidation in H_2SO_4solution at different temperature and different $KMnO_4$ concentration.

Property	**Unit**	**Short-Length MWCNTs**			**Method of Measurement**
		P/C: TN-COC-(NSR)TNSM5/20-30NM	***P/C: TN-COC-(NSR)TNSMH5/20-30NM***	***P/C: TN-COC-(NSR)TNSMC5/20-30NM***	
OD	nm	20-30	20-30	20-30	HRTEM, Raman
Purity	wt%	>95	>95	>95	TGA & TEM
Length	microns	0.5-2	0.5-2	0.5-2	TEM
SSA	m^2/g	>110	>110	>110	BET
ASH	wt%	<1.5	<1.5	<1.5	TGA
EC	s/cm	>100	>100	>100	
Tap Density	g/cm^3	0.28	0.28	0.28	
I_g/I_d	--	--	--	--	Raman
-OH Content	wt%		1.76		XPS & Titration
-COOH Content	wt%			1.23	XPS & Titration
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area					

e. Short-length Multi-walled carbon nanotubes (MWCNT)

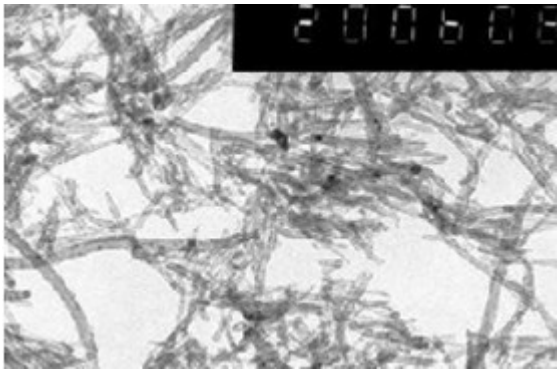




Short-length High purity Multi-walled carbon nanotubes. Have three kinds of products: TN-COC-(NSR)TNSM7, TN-COC-(NSR)TNSMH7 and TN-COC-(NSR)TNSMC7.
-TNSM7 is produced by mechanical cutting -TNM7, followed by dis-agglomeration treatment. -TNSMH7 and -TNSMC7 are the -TNSM7 hydroxyl and carboxyl functionalized products, respectively. -TNSMH7 and -TNSMC7 are prepared by $KMnO_4$ oxidation in H_2SO_4solution at different temperature and different $KMnO_4$ concentration.

Property	**Unit**	**Short-Length MWCNTs**			**Method of Measurement**
		P/C: TN-COC-(NSR)TNSM7/30-50NM	***P/C: TN-COC-(NSR)TNSMH7/30-50NM***	***P/C: TN-COC-(NSR)TNSMC7/30-50NM***	
OD	nm	30-50	30-50	30-50	HRTEM, Raman
Purity	wt%	>95	>95	>95	TGA & TEM
Length	microns	0.5-2	0.5-2	0.5-2	TEM
SSA	m^2/g	>60	>60	>60	BET
ASH	wt%	<1.5	<1.5	<1.5	TGA
EC	s/cm	>100	>100	>100	
Tap Density	g/cm^3	0.22	0.22	0.22	
I_g/I_d	--	--	--	--	Raman
-OH Content	wt%		1.06		XPS & Titration
-COOH Content	wt%			1.73	XPS & Titration
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area					

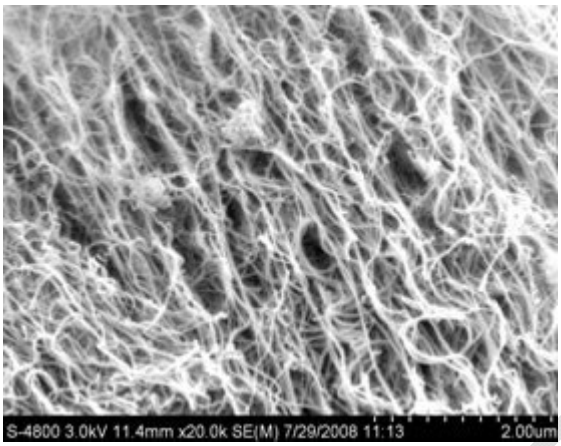
f. Short-length Multi-walled carbon nanotubes (MWCNT)



Short-length High purity Multi-walled carbon nanotubes. Have three kinds of products: TN-COC-(NSR)TNSM8, TN-COC-(NSR)TNSMH8 and TN-COC-(NSR)TNSMC8.
-TNSM8 is produced by mechanical cutting -TNM8, followed by dis-agglomeration treatment. -TNSMH8 and -TNSMC8 are the -TNSM8 hydroxyl and carboxyl functionalized products, respectively. -TNSMH8 and -TNSMC8 are prepared by $KMnO_4$ oxidation in H_2SO_4solution at different temperature and different $KMnO_4$ concentration.

Property	**Unit**	**Short-Length MWCNTs**			**Method of Measurement**
		P/C: TN-COC-(NSR)TNSM8/50NM	***P/C: TN-COC-(NSR)TNSMH8/50NM***	***P/C: TN-COC-(NSR)TNSMC/50NM***	
OD	nm	>50	>50	>50	HRTEM, Raman
Purity	wt%	>95	>95	>95	TGA & TEM
Length	microns	0.5-2	0.5-2	0.5-2	TEM
SSA	m^2/g	>40	>40	>40	BET
ASH	wt%	<1.5	<1.5	<1.5	TGA
EC	s/cm	>100	>100	>100	
Tap Density	g/cm^3	0.18	0.18	0.18	
I_g/I_d	--	--	--	--	Raman
-OH Content	wt%		0.71		XPS & Titration
-COOH Content	wt%			0.49	XPS & Titration

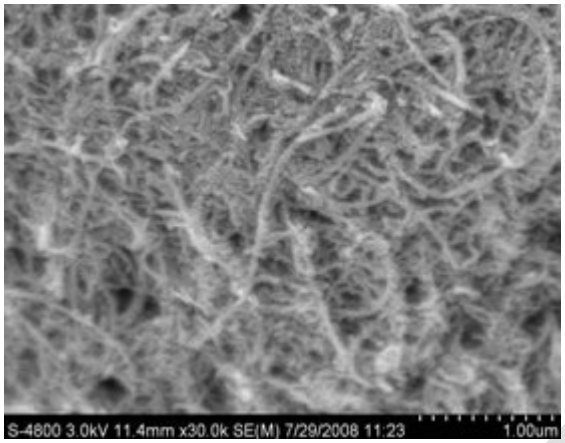
3) a. Graphitized Multi-walled Carbon nanotubes (GMWCNT)



Graphitized Multi-walled Carbon nanotubes. Have three kinds of products: TN-COC-(NSR)TNGM2, TN-COC-(NSR)TNGMH2 and TN-COC-(NSR)TNGMC2. -TNGMH2 and -TNGMC2 are -TNGM2 hydroxyl and carboxyl functionalized products, respectively.
Graphitized multi-walled carbon nanotubes are produced by 2800°C thermal treatment the relevant purified carbon nanotubes under inert gas for about 20hours. The graphitized multi-walled carbon nanotubes have the highest graphite crystallization, the best electrical conductivity and the best inoxidizability. The electrical conductivity can be compared with graphite powder, and the ignition temperature can reach 800°C.

Property	**Unit**	**GMWCNTs**			**Method of Measurement**
		P/C: TN-COC-(NSR)TNGM2/8-15NM	***P/C: TN-COC-(NSR)TNGMH2/8-15NM***	***P/C: TN-COC-(NSR)TNGMC2/8-15NM***	
OD	nm	8-15	8-15	8-15	HRTEM, Raman
Purity	wt%	>99.9	>99.9	>99.9	TGA & TEM
Length	microns	~50	~50	~50	TEM
SSA	m^2/g	>117	>117	>117	BET
ASH	wt%	<0.1	<0.1	<0.1	TGA
Tap Density	g/cm^3				
I_g/I_d	--	--	--	--	Raman
-OH Content	wt%		1.85		XPS & Titration
-COOH Content	wt%			1.28	XPS & Titration
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area					

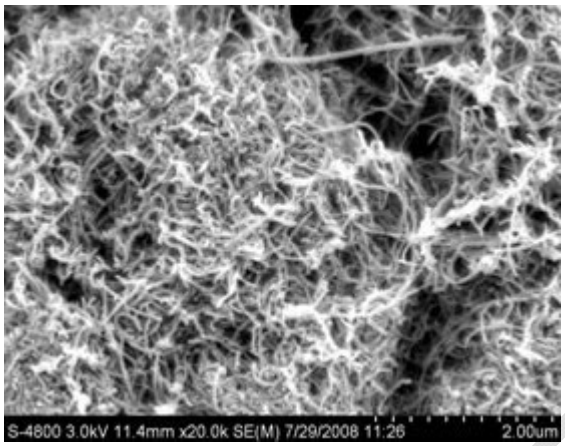
b. Graphitized Multi-walled Carbon nanotubes (GMWCNT)



Graphitized Multi-walled Carbon nanotubes. Have three kinds of products: TN-COC-(NSR)TNGM3, TN-COC-(NSR)TNGMH3 and TN-COC-(NSR)TNGMC3. -TNGMH3 and -TNGMC3 are -TNGM3 hydroxyl and carboxyl functionalized products, respectively.
Graphitized multi-walled carbon nanotubes are produced by 2800°C thermal treatment the relevant purified carbon nanotubes under inert gas for about 20hours. The graphitized multi-walled carbon nanotubes have the highest graphite crystallization, the best electrical conductivity and the best inoxidizability. The electrical conductivity can be compared with graphite powder, and the ignition temperature can reach 800°C.

Property	**Unit**	**GMWCNTs**			**Method of Measurement**
		P/C: TN-COC-(NSR)TNGM3/10-20NM	***P/C: TN-COC-(NSR)TNGMH3/10-20NM***	***P/C: TN-COC-(NSR)TNGMC3/10-20NM***	
OD	nm	10-20	10-20	10-20	HRTEM, Raman
Purity	wt%	>99.9	>99.9	>99.9	TGA & TEM
Length	microns	10-20	10-20	10-20	TEM
SSA	m^2/g	>100	>100	>100	BET
ASH	wt%	<0.1	<0.1	<0.1	TGA
Tap Density	g/cm^3				
I_g/I_d	--	--	--	--	Raman
-OH Content	wt%		1.53		XPS & Titration
-COOH Content	wt%			1.00	XPS & Titration
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area					

c. Graphitized Multi-walled Carbon nanotubes (GMWCNT)



Graphitized Multi-walled Carbon nanotubes. have three kinds of products: TN-COC-(NSR)TNGM5, TN-COC-(NSR)TNGMH5 and TN-COC-(NSR)TNGMC5. -TNGMH5 and -TNGMC5 are -TNGM5 hydroxyl and carboxyl functionalized products, respectively.
Graphitized multi-walled carbon nanotubes are produced by 2800°C thermal treatment the relevant purified carbon nanotubes under inert gas for about 20hours. The graphitized multi-walled carbon nanotubes have the highest graphite crystallization, the best electrical conductivity and the best inoxidizability. The electrical conductivity can be compared with graphite powder, and the ignition temperature can reach 800°C.

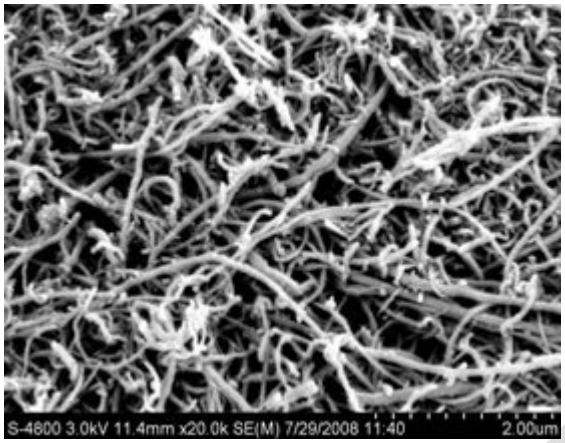
Property	**Unit**	**GMWCNTs**			**Method of Measurement**
		P/C: TN-COC-(NSR)TNGM5/20-30NM	***P/C: TN-COC-(NSR)TNGMH5/20-30NM***	***P/C: TN-COC-(NSR)TNGMC5/20-30NM***	
OD	nm	20-30	20-30	20-30	HRTEM, Raman
Purity	wt%	>99.9	>99.9	>99.9	TGA & TEM
Length	microns	10-30	10-30	10-30	TEM
SSA	m^2/g	>55	>55	>55	BET
ASH	wt%	<0.1	<0.1	<0.1	TGA
Tap Density	g/cm^3				
I_g/I_d	--	--	--	--	Raman
-OH Content	wt%		0.88		XPS & Titration
-COOH Content	wt%			0.61	XPS & Titration
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area					

d. Graphitized Multi-walled Carbon nanotubes (GMWCNT)

Graphitized Multi-walled Carbon nanotubes. Have three kinds of products: TN-COC-(NSR)TNGM7, TN-COC(NSR)TNGMH7 and TN-COC-(NSR)TNGMC7.- TNGMH7 and -TNGMC7 are -TNGM7 hydroxyl and carboxyl functionalized products, respectively.
Graphitized multi-walled carbon nanotubes are produced by 2800°C thermal treatment the relevant purified carbon nanotubes under inert gas for about 20hours. The graphitized multi-walled carbon nanotubes have the highest graphite crystallization, the best electrical conductivity and the best inoxidizability. The electrical conductivity can be compared with graphite powder, and the ignition temperature can reach 800°C.

Property	**Unit**	**GMWCNTs**			**Method of Measurement**
		P/C: TN-COC-(NSR)TNGM7/20-50NM	***P/C: TN-COC-(NSR)TNGMH7/20-50NM***	***P/C: TN-COC-(NSR)TNGMC7/20-50NM***	
OD	nm	30-50	30-50	30-50	HRTEM, Raman
Purity	wt%	>99.9	>99.9	>99.9	TGA & TEM
Length	microns	10-20	10-20	10-20	TEM
SSA	m^2/g	>30	>30	>30	BET
ASH	wt%	<0.1	<0.1	<0.1	TGA
Tap Density	g/cm^3				
I_g/I_d	--	--	--	--	Raman
-OH Content	wt%		0.53		XPS & Titration
-COOH Content	wt%			0.36	XPS & Titration
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area					

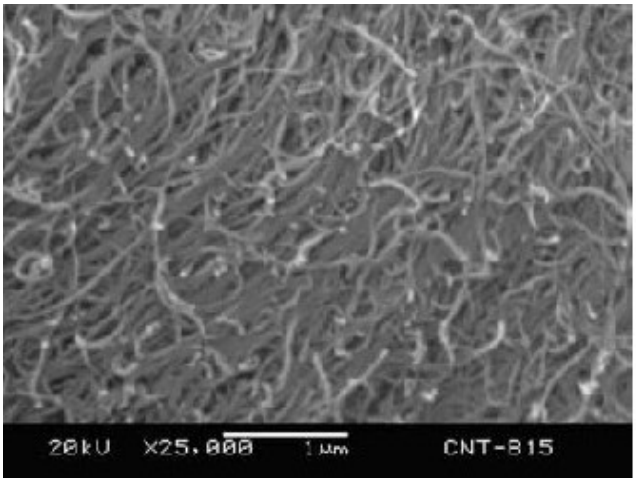
e. Graphitized Multi-walled Carbon nanotubes (GMWCNT)

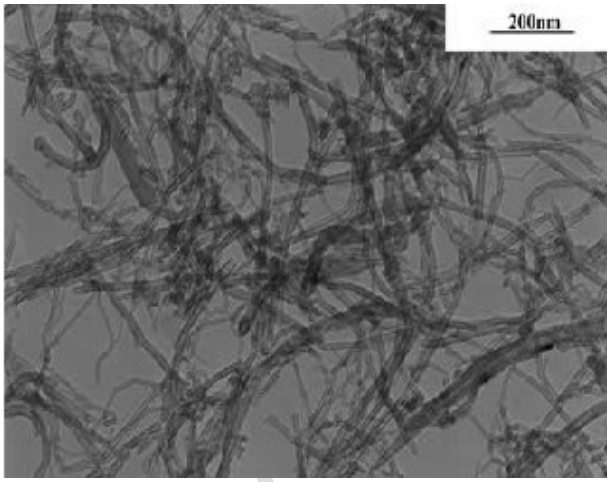


Graphitized Multi-walled Carbon nanotubes. Have three kinds of products: TN-COC-(NSR)TNGM8, TN-COC-(NSR)TNGMH8 and TN-COC-(NSR)TNGMC8.- TNGMH8 and -TNGMC8 are -TNGM8 hydroxyl and carboxyl functionalized products, respectively.
Graphitized multi-walled carbon nanotubes are produced by 2800°C thermal treatment the relevant purified carbon nanotubes under inert gas for about 20hours. The graphitized multi-walled carbon nanotubes have the highest graphite crystallization, the best electrical conductivity and the best inoxidizability. The electrical conductivity can be compared with graphite powder, and the ignition temperature can reach 800°C.

Property	**Unit**	**GMWCNTs**			**Method of Measurement**
		P/C: TN-COC-(NSR)TNGM8/50NM	***P/C: TN-COC-(NSR)TNGMH8/50NM***	***P/C: TN-COC-(NSR)TNGMC8/50NM***	
OD	nm	>50	>50	>50	HRTEM, Raman
Purity	wt%	>99.9	>99.9	>99.9	TGA & TEM
Length	microns	10-30	10-30	10-30	TEM
SSA	m^2/g	>20	>20	>20	BET
ASH	wt%	<0.1	<0.1	<0.1	TGA
Tap Density	g/cm^3				
I_g/I_d	--	--	--	--	Raman
-OH Content	wt%		0.36		XPS & Titration
-COOH Content	wt%			0.25	XPS & Titration
OD=Outer Diameter, ID=Inner Diameter, SSA=Special Surface Area					

4) a. Amino Carbon Nanotubes





Amino Carbon nanotubes: TN-COC-(NSR)TNMN2。

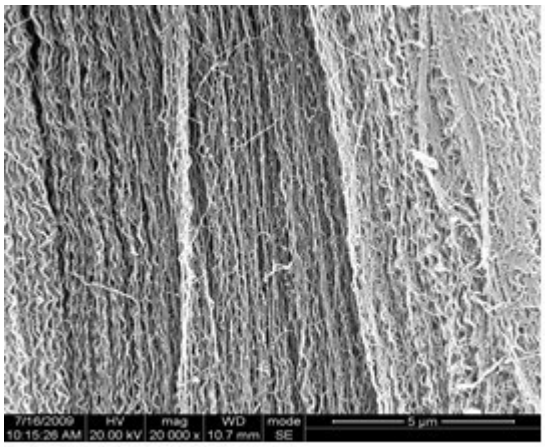
Property	Unit	P/C: TN-COC-(NSR)TNMN2/8-15NM	Method of Measurement
OD	nm	8-15	HRTEM, Raman
Purity	wt%	>95	TGA & TEM
Length	microns	~50	TEM
SSA	m^2/g	>233	BET
ASH	wt%	<1.5	TGA
EC	s/cm	>100	
Tap Density	g/cm^3	0.27	
Ig/Id	--	--	Raman
PH （1wt%）	--	9.62	
-NH_2 Content	wt%	0.45%	XPS & Titration
OD=Outer Diameter, SSA=Special Surface Area, EC=Electric Conductivity			

b. Ni coated Multi-walled carbon nanotubes (MWCNT)

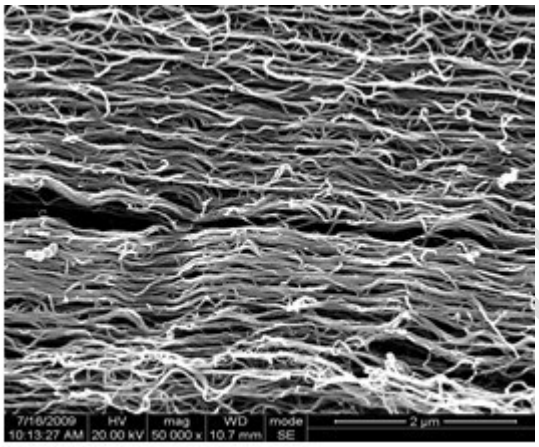
Ni coated Multi-walled carbon nanotube. Have five kinds of products: TN-COC(NSR)TNNiM2, TN-COC(NSR)TNNiM3, TN-COC-(NSR)TNNiM5, -TNNiM7, -TNNiM8 by the outer diameter to divided. They are composite of Ni and Carbon nanotubes, and the carbon nanotubes are coated by Ni. These carbon nanotubes are producted via the catalytic carbon vapor deposition (CCVD) process.

Property	**Unit**	**NiMWCNTs**					**Method of Measurement**
		P/C: TN-COC-(NSR)TNNiM2/ 8-15NM	***P/C: TN-COC-(NSR)TNNiM3/ 10-20NM***	***P/C: TN-COC-(NSR)TNNiM5/ 20-30NM***	***P/C: TN-COC-(NSR)TNNiM7/ 30-50NM***	***P/C: TN-COC-(NSR)TNNiM 8/50NM***	
OD	nm	8-15	10-20	20-30	30-50	>50	HRTEM, Raman
Ni Content	wt%	>60	>60	>60	>60	>60	TGA & TEM
CNTs Content	wt%	>38	>38	>38	>38	>38	TGA & TEM
Length	microns	~50	10-30	10-30	10-20	10-20	TEM
SSA	m^2/g						BET
ASH	wt%						TGA
EC	s/cm						
Tap Density	g/cm^3	0.83	0.83	0.83	0.83	0.83	
I_g/I_d	--						Raman
CNTs Content	wt%	>38	>38	>38	>38	>38	XPS & Titration
Ni Content	wt%	>60	>60	>60	>60	>60	XPS & Titration
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area							

c. Aligned Multi-walled carbon nanotubes



SEM

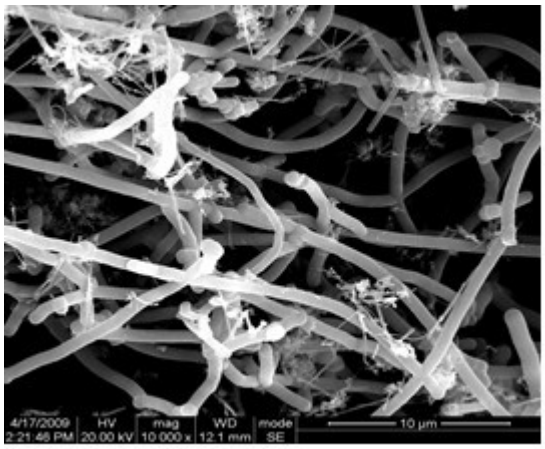


SEM

Aligned Multi-walled carbon nanotubes. This kind of product gathered in bundles, and most of the nanotubes arrayed in same direction. The bundle length often reaches 100 microns. This kind of product was produced by acetylene catalytic decomposition over Ni-based catalyst at elevated temperature. It has good electrical conductivity and good dispensability.

Property	**Unit**	**Aligned MWCNTs**	**Method of Measurement**
		P/C: TN-COC-(NSR)TNAIM/10-20NM	
OD	nm	10-20	HRTEM, Raman
Purity	wt%	>95	TGA & TEM
Length	microns	30-100	TEM
SSA	m^2/g	>180	BET
ASH	wt%	<2	TGA
Tap Density	g/cm^3	0.07	
Ignited Temperature	℃	661	TPO
Ig/Id	--	--	Raman
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area			

d. Carbon Nano Fibers



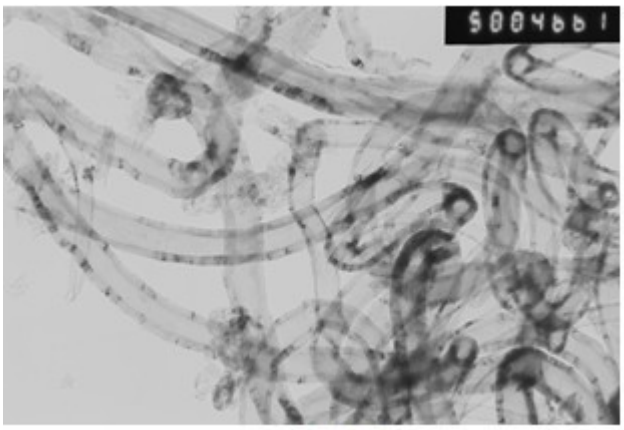
SEM

TEM

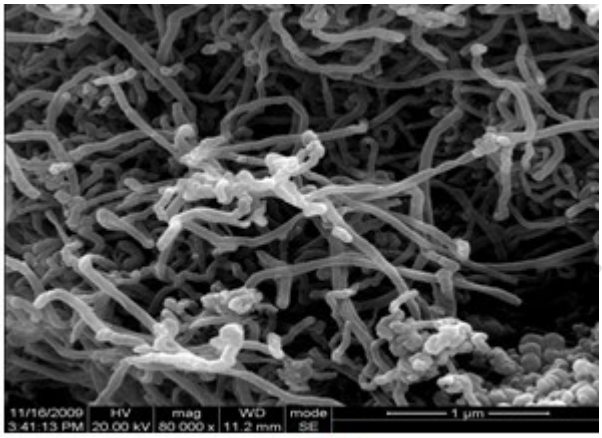
Carbon Nano Fibers. It is produced by xylene catalytic decomposition using ferrocene as catalyst in float reactor. It has a wide diameter distribution. The outer diameter of this product distributes from tens nanometers to hundreds nanometers, and most of the carbon nanofibers has a diameter 200~600nm. It contains a small amount of carbon nanotubes and amorphous carbon.

Property	**Unit**	**Carbon Nano Fibers**	**Method of Measurement**
		P/C: TN-COC-(NSR)TNCF/200-600NM	
OD	nm	200-600	HRTEM, Raman
CNTs Purity	wt%	>70	TGA & TEM
Length	microns	5-50	TEM
SSA	m^2/g	>18	BET
ASH	wt%	<5	HRTEM,TGA
EC	s/cm	>100	
Tap Density	g/cm^3	0.043	
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area			

e. Large-Inner Diameter Multi-walled carbon nanotubes



TEM



SEM

Large-Inner Diameter Multi-walled carbon nanotubes. This kind of products is prepared by acetylene catalytic decomposition over Ni-based catalyst. The inner diameter is often more than 20nm, and the thickness of the CNTs'wall is about 5nm. Moreover, most of the CNTs have 30-80nm outer diameter.

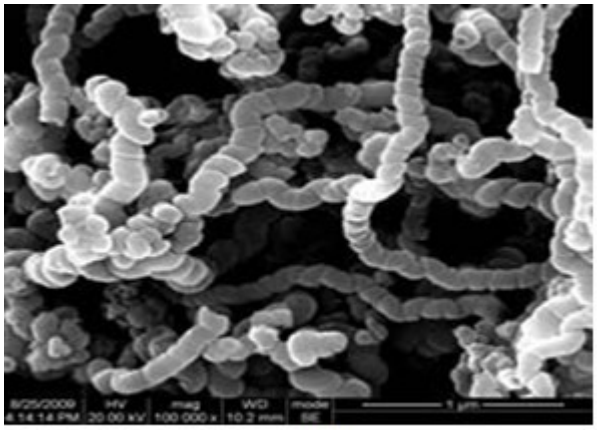
Property	**Unit**	**Large-Inner Diameter Thin-wall carbon nanotubes**	**Method of Measurement**
		P/C: TN-COC-(NSR)TNLIM/30-60NM	
OD	nm	30-60	HRTEM, Raman
ID	nm	20-50	HRTEM, Raman
CNTs Purity	wt%	>70	TGA & TEM
Length	microns	1-10	TEM
SSA	m^2/g	>200	BET
ASH	g/cm^3	<2.0	HRTEM,TGA
EC	s/cm	>100	
Tap Density	g/cm^3	0.0441	
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area			

f. Flash-Ignition Carbon Nanotubes

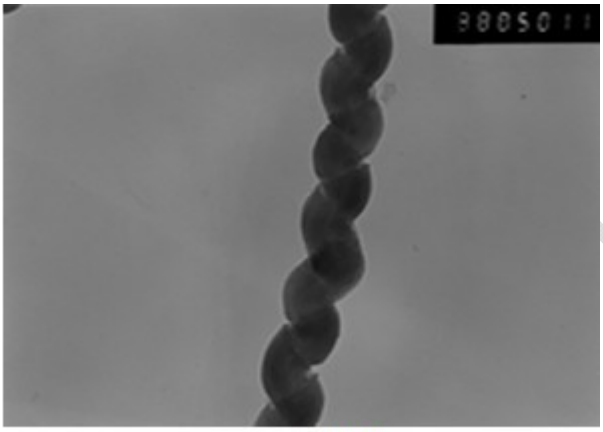
Flash-ignition carbon nanotubes. This kind of carbon nanotubes can be ignited by a household camera flash. It is composed of thin diameter multi-walled carbon nanotubes, amorphous carbon and some Fe nanoparticles. The Fe nanoparticles content is about 25wt% in this product. It is a fresh-made product. It was produced by xylene pyrolysis using ferrocene as catalyst.

Property	**Unit**	**Flash-ignited carbon nanotubes** *P/C: TN-COC-(NSR)TNFIM/2-50NM*	**Method of Measurement**
OD	nm	2-50nm	HRTEM, Raman
CNTs Content	wt%	>50	TGA & TEM
Carbon Cntent	wt%	>70	TGA & TEM
Length	microns	~50	TEM
SSA	m^2/g	>300	BET
Fe Content	wt%	<25	TGA & TEM
Tap Density	g/cm^3	0.2	
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area			

g. Helical Multi-walled carbon nanotubes



SEM



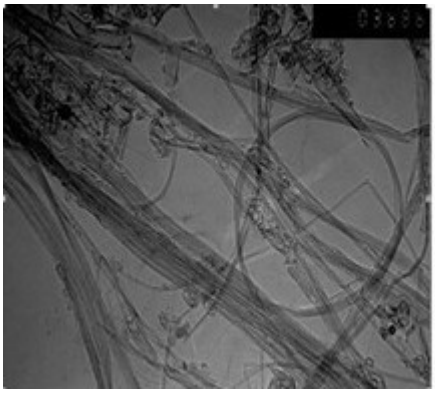
TEM

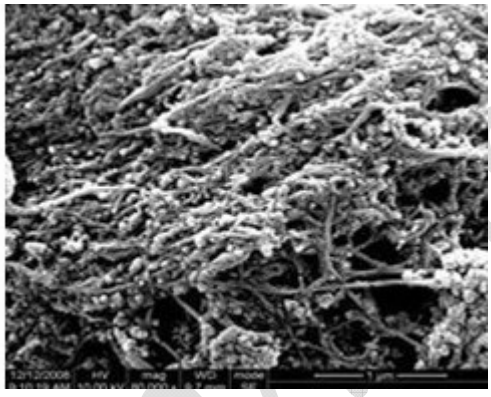
Helical Multi-walled carbon nanotubes. This kind of product is prepared by acetylene catalytic decomposition over Ni-based catalyst. The content of helical structure CNTs is about 60wt%. The rest is ordinary CNTs. The total CNTs content is more than 90wt%, and most of the CNTs have 100-200nm outer diameter.

Property	**Unit**	**Helical MWCNTs** *P/C: TN-COC-(NSR)TNHIM/100-200NM*	**Method of Measurement**
OD	nm	100-200	HRTEM, Raman
CNTs Content	wt%	>90	TGA & TEM
HCNTs Content	wt%	>60	TGA & TEM
Length	microns	1-10	TEM
SSA	m^2/g	>30	BET
ASH	wt%	<5	TGA
Tap Density	g/cm^3	---	
Ignited Temperature	℃	560-600	TPO
Ig/Id	--	--	Raman
OD=Outer Diameter		ID=Inner Diameter	SSA=Special Surface Area

Double Walled Carbon Nanotubes

a. Double Walled Carbon Nanotubes

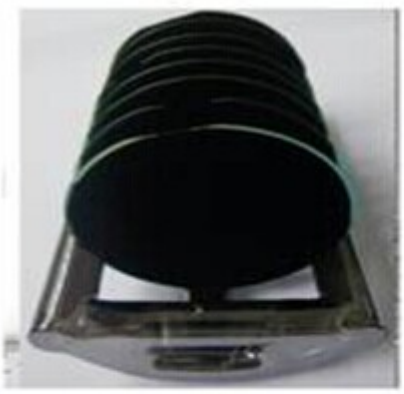


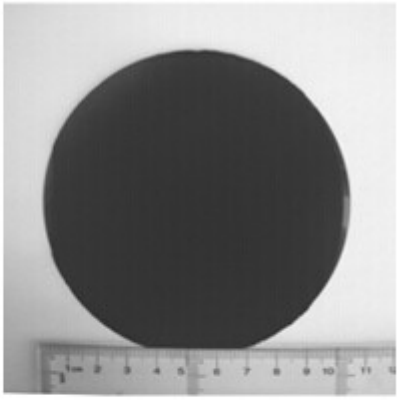
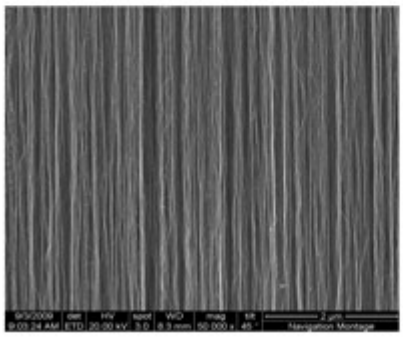
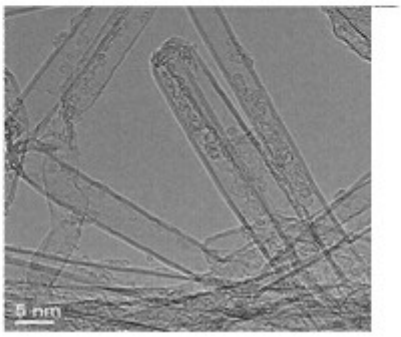
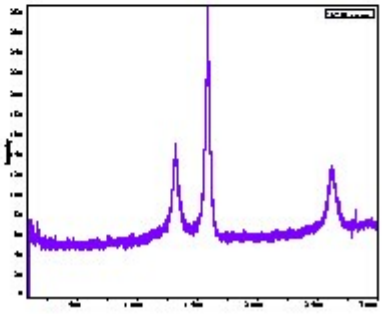


Double-walled carbon nanotubes. There are three kinds of product in this catalog. They are TN-COCO(NSR)TND, TN-COC-(NSR)TNDH and TN-COC-(NSR)TNDC.
-TND was produced by methane catalytic decomposition over Co-based catalyst, followed treated by air oxidation and acid solution. -TNDH and -TNDC are -TND hydroxyl and carboxyl functionalized products, respectively. This kind of product contains double-walled carbon nanotubes, single-walled carbon nanotubes, multi-walled carbon nanotubes and some amorphous carbon. The double-walled carbon nanotubes content is about 60wt%, but the CNTs content can reach 90wt%.

Property	Unit	DWCNTs			Method of Measurement
		P/C: TN-COC-(NSR)TND/2-4NM	***P/C: TN-COC-(NSR)TNDH/2-4NM***	***P/C: TN-COC-(NSR)TNDC/2-4NM***	
OD	nm	2-4	2-4	2-4	HRTEM, Raman
Purity	wt%	>60	>60	>60	TGA & TEM
Length	microns	~50	~50	~50	TEM
SSA	m^2/g	>350	>350	>350	BET
ASH	wt%	<1.5	<1.5	<1.5	TGA
EC	s/cm	>100	>100	>100	
Tap Density	g/cm^3	0.14	0.14	0.14	
I_g/I_d	--	--	--	--	Raman
-OH Content	wt%		3.96		XPS & Titration
-COOH Content	wt%			2.73	XPS & Titration
OD=Outer Diameter ID=Inner Diameter SSA=Special Surface Area					

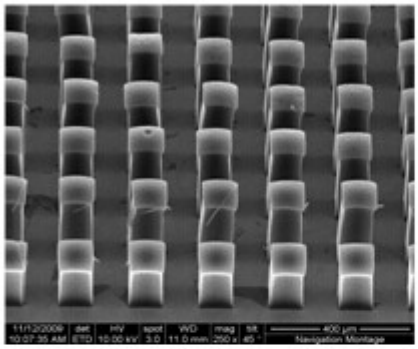
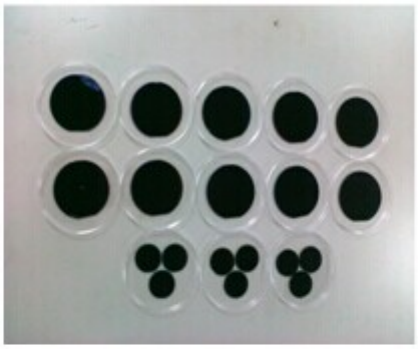
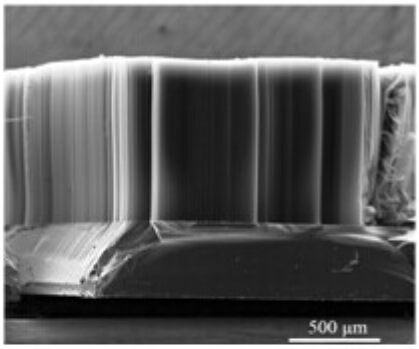
Single/Double walled Carbon Nanotubes Arrays (Chemical vapor deposition method)

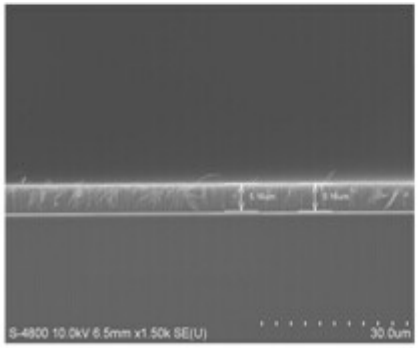
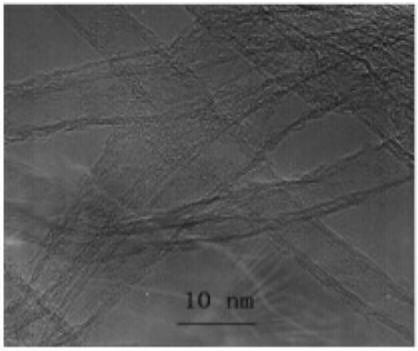


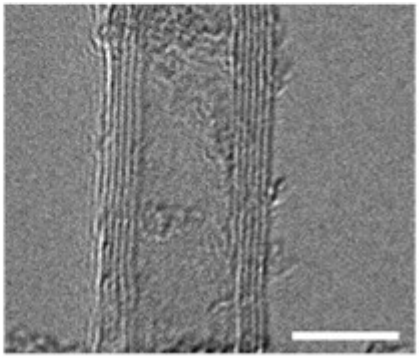





Catalog	*P/C: TN-COC-(NSR)TNSAD4*	*P/C:TN-COC-(NSR)TNSAD2*	*P/C: TN-COC-(NSR)TNSAD22*	*P/C: TN-COC-(NSR)TNSAD11*
Shape	Disc	Disc	Rectangle	Rectangle
Size	Φ 4 inch	Φ 2 inch	2 cm×2 cm	1 cm×1 cm
Height	10 - 400μm			
No. of Walls	1-2			
Diameter	1 - 4nm			
CNTpurity	98%			
Density	≤0.3 g/cm^3			
SSA	~20 m^2/g			
Electrical conductivity	10^3 S/m			
Substrates	Monocrystal silicon/Polycrystal silicon/Quartz			

Multi walled Carbon Nanotube Arrays Multi walled Carbon Nanotubes Arrays

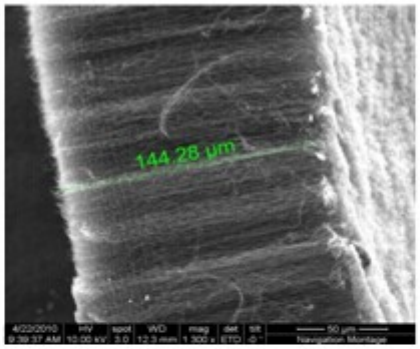




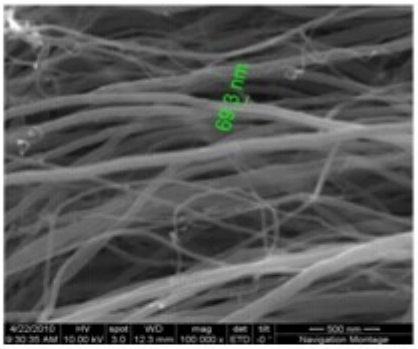



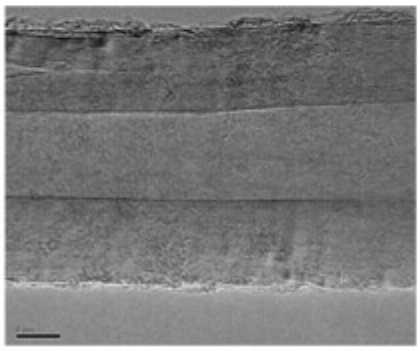


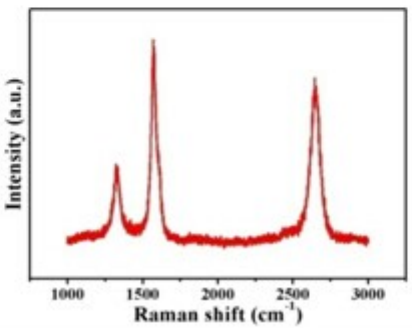
Catalog	*P/C: TN-COC-(NSR)TNWAD4*	*P/C: TN-COC-(NSR)TNWAD2*	*P/C: TN-COC-(NSR)TNWAD22*	*P/C: TN-COC-(NSR)TNWAD11*
Shape	Disc	Disc	Rectangle	Rectangle
Size	Φ 4 inch	Φ 2 inch	2 cm×2 cm	1 cm×1 cm
Height	10 - 1000μm			
No. of Walls	3-7			
Diameter	3- 10nm			
CNT purity	98%			
Density	≤0.3 g/cm^3			
SSA	~20 m^2/g			
Electrical conductivity	10^3 S/m			
Substrates	Monocrystal silicon/Polycrystal silicon/Quartz			

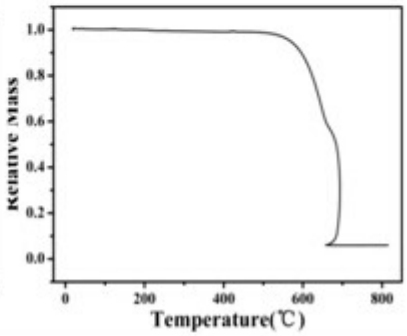
Multi walled Carbon Nanotubes Arrays (Floating Chemical vapor deposition method)





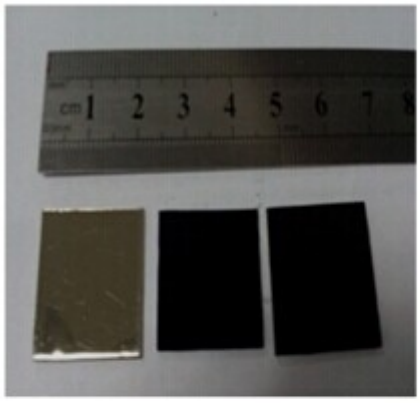
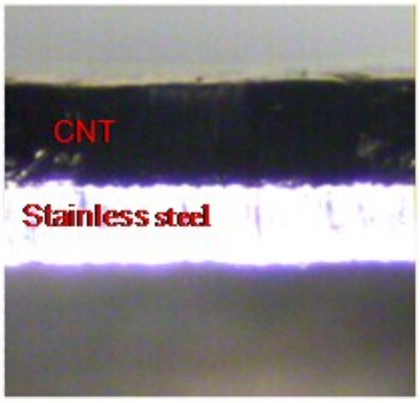


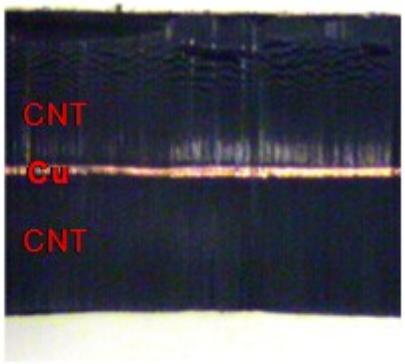


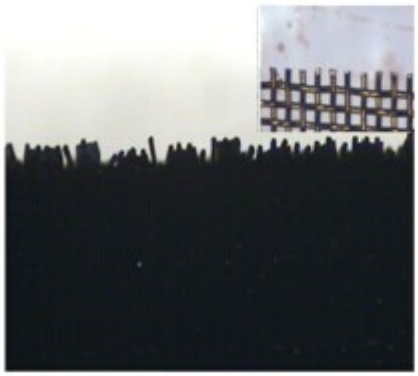


Catalog	*P/C: TN-COC-(NSR)TNWFAD2*	*P/C: TN-COC-(NSR)TNWFAD77*	*P/C: TN-COC-(NSR)TNWFAD55*
Shape	Disc	Rectangle	Rectangle
Size	Φ2inch	7cm×7cm	5cm×5cm
Height	50 - 1000µm		
No. of Walls	>10		
Diameter	>50nm		
CNT purity	95%		
Density	≤0.3 g/cm^3		
SSA	~20 m^2/g		
Electrical conductivity	10^3 S/m		
Substrates	Monocrystalline silicon/ Polycrystal silicon/ Quartz/Copper/Nickel/ Stainless steel		

Transferred Carbon Nanotube Arrays

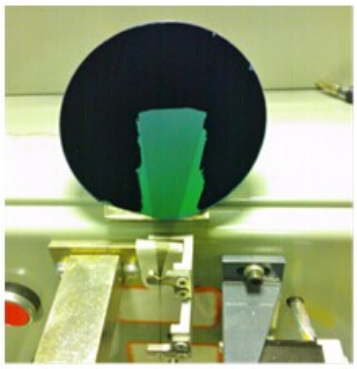



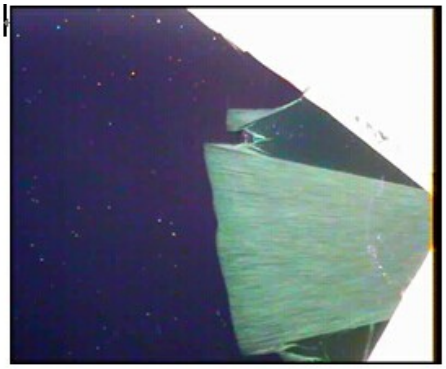


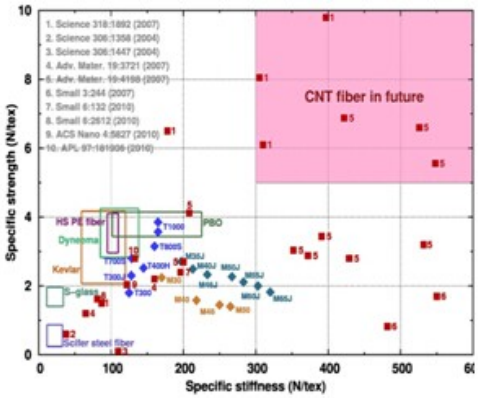


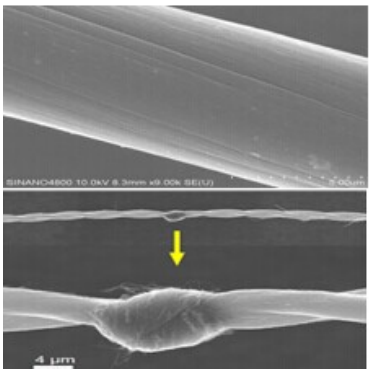
Catalog	*P/C: TN-COC-(NSR)TNCA22*	*P/C: TN-COC-(NSR)TNCA11*
Shape	Rectangle	Rectangle
Size	2cm×2cm	1cm×1cm
Height	10 - 1000μm	
No. of Walls	>1	
Diameter	>3nm	
CNT purity	>95%	
Density	≤0.3 g/cm^3	
SSA	~20 m^2/g	
Electrical conductivity	10^3 S/m	
Substrates	Metal/Plastic/Glass/Cloth/Paper/Double shift	

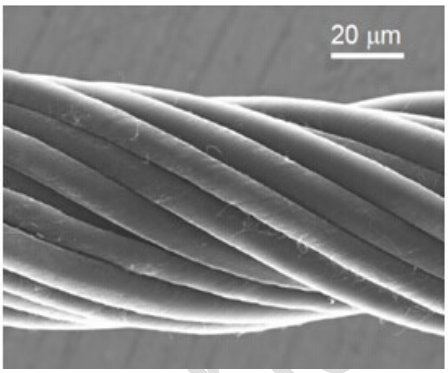
Carbon Nanotubes Fibers

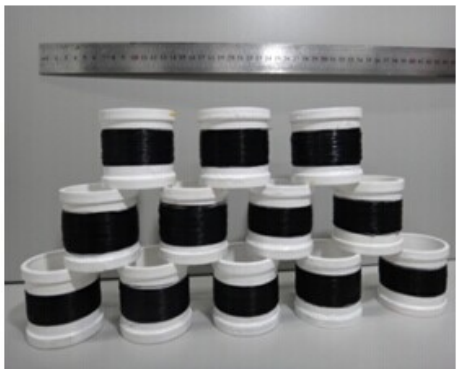












Catalog	*P/C: TN-COC-(NSR)TNF300*	*P/C: TN-COC-(NSR)TNF800*	*P/C: TN-COC-(NSR)TNF1000*	*P/C: TN-COC-(NSR)TNF1200*
Length	1 ~ 20 m			
Diameter	20-30 μm		5-12μm	
Strength	270-310 MPa	800-1000 MPa	1000-1200 MPa	1200-1500 MPa
Modulus	4-6 GPa	50-100 GPa	50-100 GPa	50-100 GPa
Strain	15-25 %	2-3.5%	2-3.5%	2.5-3.5%
Density	0.3-0.5 g/cm^3	0.3-0.5g/cm3	0.5-0.8g/cm3	0.8-1.0g/cm3
Conductivity	7×10^4~1×10^5S/m	5×10^4~7×10^4 S/m		

Carbon Nanotubes Dispersion

a. MWNTs Paste – High CNTs Content Dispersion

Promoting the CNTs dispersion industrial application，we provide the high CNTs content dispersion—MWNTs paste products，dispersed by grinding. MWNTs Code is TN-COC-(NSR)TNM8.

Products Name	Products Code	MWNTs Content	Non-volatile matter	Packing
MWNTs aqueous paste	***P/C: TN-COC-(NSR)TNWPM***	8%wt	9.6%wt	500g
MWNTs isopropanol paste	***P/C: TN-COC-(NSR)TNAPM***	8%wt	9.6%wt	500ml
MWNTs butyl acetate paste	***P/C: TN-COC-(NSR)TNEPM***	8%wt	12.5%wt	500ml
MWNTs N-methyl-2-pyrrolidone	***P/C: TN-COC-(NSR)TNNMP***	8%wt	9.6%wt	500ml
MWNTs dimethylformamide paste	***P/C: TN-COC-(NSR)TNDPM***	8%wt	9.6%wt	500ml

b. SWNTs Aqueous Dispersion

-SWNTs aqueous dispersion consists of three components: -SWNTs,non-ionic surfactant -TNWDIS and deionized water. Dispersed by sonicator, separated with centrifugal sedimentation for 60 min at 4000rpm, storage stability is more than one year.
-SWCNTs aqueous dispersion can be used in transparent conductive materials to take the place of conductive polymer dispersion.

Products Name	Products Code	SWNTs Content	SWNTs Code	Packing
High purity SWNTs aqueous dispersion	***P/C: TN-COC-(NSR)TNWDST***	1‰ wt	TNST	100g 200g
Short High purity SWNTs aqueous dispersion	***P/C: TN-COC-(NSR)TNWDSST***	1‰ wt	TNSST	100g 200g
Carboxyl Purified SWNTs aqueous dispersion	***P/C: TN-COC-(NSR)TNWDSC***	0.5-0.6% wt	TNSC	100g 200g

c. MWNTs Aqueous/Solvent-based Dispersion

MWNTs aqueous / solvent-based dispersion
-MWNTs dispersion include two kinds of product form aqueous dispersion and solvent-based dispersion.
-MWNTs dispersion consists of three components: -MWNTs, dispersant and dispersate. Dispersed by sonicator, separated with centrifugal sedimentation for 30 min at 2000rpm, storage stability is more then half a year.
-MWNTs dispersion can be widely applied in paint, composites, lubricants, thermal conductive medium and other fields.

Products Name	Products Code	MWNTs Content	MWNTs Code	Packing
MWNTs aqueous dispersion	***P/C: TN-COC-(NSR)TNWDM***	2-3%wt	TNM8	500g
MWNTs isopropanol dispersion	***P/C: TN-COC-(NSR)TNADM***	2-3%wt	TNM8	500ml
MWNTs butyl acetate dispersion	***P/C: TN-COC-(NSR)TNEDM***	2-3%wt	TNM8	500ml
MWNTs dimethylformamide dispersion	***P/C: TN-COC-(NSR)TNDDM***	2-3%wt	TNM8	500ml

d. CNTs Dispersant

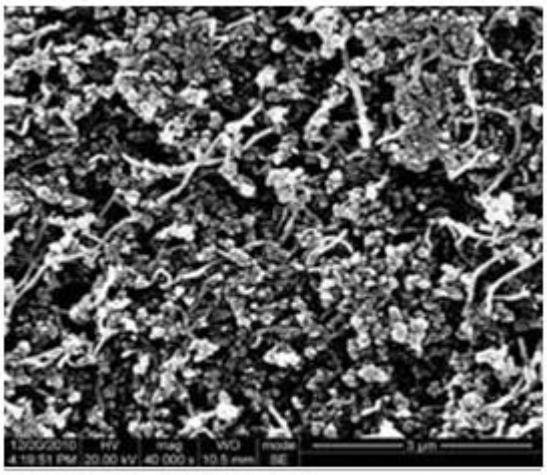
Product Name	Product Code	Parameters	Packing
CNTs Water dispersant	***P/C: TN-COC-(NSR)TNWDIS***	Aromatic modified polyethylene glycol ether in aqueous solution, Non-volatile matter: 90 %	100g
CNTs alcohol dispersant	***P/C: TN-COC-(NSR)TNADIS***	Powder polymer dispersant .For TNM8, the recommended dosage of dispersants is 30% of the weight of the carbon nanotubes.	100g
CNTs ester dispersant	***P/C: TN-COC-(NSR)TNEDIS***	Solution of a high molecular weight block copolymer with pigment affinity groups, Non-volatile matter: 45 %	100g
CNTs NMP dispersant	***P/C: TN-COC-(NSR)TNNDIS***	Powder polymer dispersant, especially suitable for carbon nanotubes dispersion in N - methyl pyrrolidone. For TNM8, the recommended dosage of dispersants is 20% of the weight of the carbon nanotubes.	100g
CNTs DMF dispersant	***P/C: TN-COC-(NSR)TNDDIS***	Powder polymer dispersant, especially suitable for carbon nanotubes dispersion in N, N - dimethyl form amide. For TNM8, the recommended dosage of dispersants is 20% of the weight of the carbon nanotubes.	100g

Carbon Nanotubes Conductive Filler

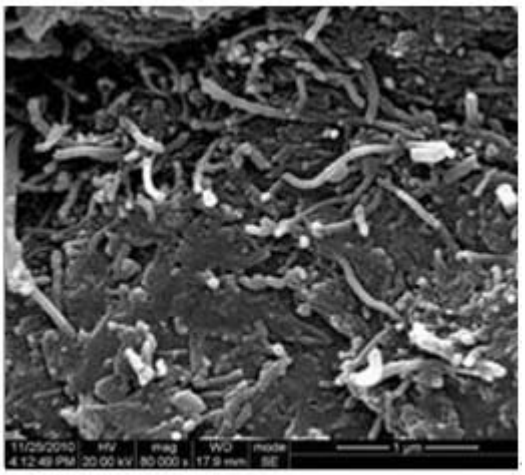
a. CNTs Conductive Filler for Plastics

In order to solve the problem of -CNTs dispersion, promote the -CNTs application in conductive plastics, Timesnano provide the- CNTs conductive filler products for plastics prepared by electrostatic self-assembly between -CNTs and carbon black (or polystyrene microsphere)

Products Name	COC-CF-3S	COC-CF-4
Ingredient	CNTs/ Carbon black Chezacarb B	CNTs/ Polystyrene microsphere
Composition (wt%)	40/60	20/80
MWNTs code	P/C: TN-COC-(NSR)TNIM4	P/C: TN-COC-(NSR)TNIM4
Appearance	Black powder	Black powder
Volume resistivity (Ω.cm)	＜0.01	＜10
Refined linseed oil absorption value (ml/100g)	420-440	130-150
N2 adsorption specific surface area(m2/g)	540-560	11-13
Application	General economy	PS、ABS



CF-3S: CNTs/ Carbon black Chezacarb B

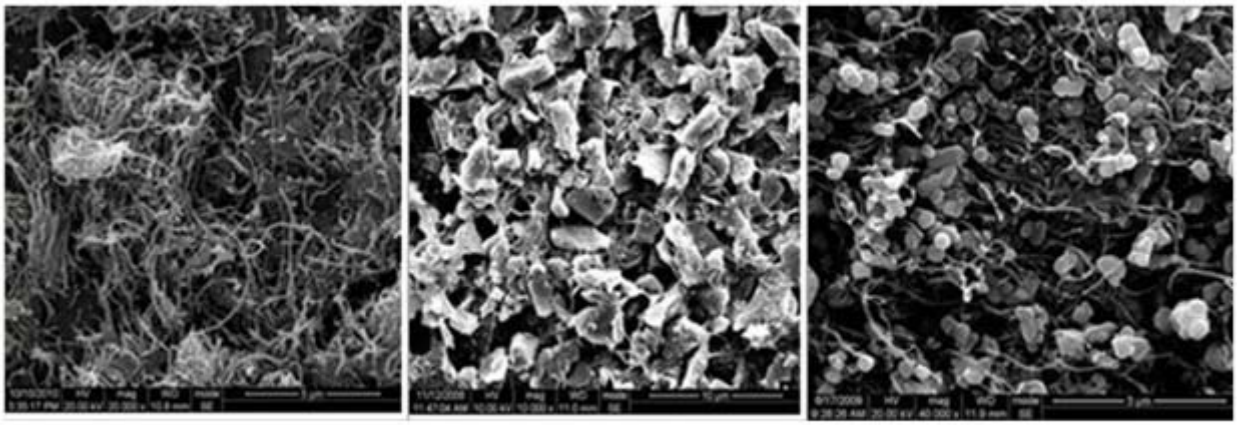


CF-4: CNTs/ Polystyrene microsphere

b. CNTs Conductive Filler for Coating

In order to solve the problem of CNTs dispersion, promote the CNTs application in conductive coating, Timesnano provide the CNTs conductive filler products for coating, prepared by electrostatic self-assembly between CNTs and mica (or titanium dioxide or carbon black)

Products Name	COC-CF-0	COC-CF-1	COC-CF-2	COC-CF-2N	COC-CF-6	COC-CF-3T
Ingredient	CNTs/Dispersant	CNTs/ Mica	CNTs/Titanium dioxide	CNTs/Titanium dioxide	CNTs/Titanium dioxide	CNTs/HI black 40B2
Composition (wt %)	90/10	10/90	10/90	20/80	6/94	40/60
MWNTs code	P/C: TN-COC-(NSR)TNIM8	P/C: TN-COC-(NSR)TNIM8	P/C: TN-COC-(NSR)TNIM8	P/C: TN-COC-(NSR)TNIM8	P/C: TN-COC-(NSR)TNM1	P/C: TN-COC-(NSR)TNIM8
Volume resistivity (Ω.cm)	$\sim 10^{-3}$	<10	<5	<2	<5	$\sim 10^{-3}$
Refined linseed oil absorption value (ml/100g)	200-220	35-40	45-50	60-65	45-50	140-160
N_2 adsorption specific surface area(m^2/g)	35-45	9-11	14-16	17-19	15-17	65-75



CF-0: CNTs/Dispersant CF-1: CNTs/ Mica CF-2N: CNTs/Titanium dioxide

Carbon Nanotubes Polymer Composites

a. CNTs/PA6 Master batches

Description:

Product Code	Matrix Resin	Matrix Resin Loading	CNTs Code	CNTs Loading
TN-COC-(NSR)TNPA6	PA6	85wt%	P/C: TN-COC-(NSR)TNIM4	15wt%

-TNPA6 was diluted by PA6 using twin-screw extruder, then the specimens were made by compression moulding. Volume and surface resistivity were measured by high insulation resistance instrument ZC-90D （IEC 60093-1980, the test voltage is 100V).

CNTs Loading （wt%）	2	3
Volume Resistivity (ohm.cm)	2.2×10^{12}	6.3×10^{7}
Surface Resistivity (ohm)	1.6×10^{13}	2.7×10^{7}

-TNPA6 was diluted by PA6 using twin-screw extruder, then the specimens were made by injection moulding. The standard of mechanical property of specimens was ISO 527, ISO 180 and ISO 178.

CNTs Loading （wt%）	0（Pure PA6）	3
Tensile Strength （MPa）	62.6	71.4
Stain at break （%）	52.9	17.8
Izod Notched Impact Strength （KJ/m^2）	7.9	4.1
Flexural Strength （MPa）	77.5	82.6
Flexural Modulus （MPa）	1696	1940

b. CNTs/HDPE Master batches

Description:

Product Code	Matrix Resin	Matrix Resin Loading	CNTs Code	CNTs Loading
TN-COC-(NSR)TNHDPE	HDPE 5000S	80~85 wt %	P/C: TN-COC-(NSR)TNIM4	15~20 wt %

-TN HDPE was diluted by HDPE 5000S using twin-screw extruder, then the specimens were made by compression moulding. The standard of mechanical property of specimens was ISO 527, ISO 180 and ISO 178. Volume and surface resistivity were measured by high insulation resistance instrument ZC-90D（IEC 60093-1980, the test voltage is 100V).

CNTs Loading （wt%）	2.5	3	3.5
Volume Resistivity (ohm.cm)	$>10^{14}$	3×10^{10}	6.6×10^{7}
Surface Resistivity (ohm)	1.1×10^{13}	4.3×10^{7}	2.4×10^{6}
Tensile yield Strength （MPa）	26.4	27	27.4
Tensile Strength at break （MPa）	29.2	33.4	31.8
Stain at break（%）	714	784	736
Izod Notched Impact Strength （KJ/m²）	20.6	18.5	18
Flexural Strength （MPa）	20	22.6	20.5
Flexural Modulus （MPa）	818	940	808
Melt Index （g/10min，2.16Kg/190℃）	0.89	0.83	0.74

c. CNTs/HIPS Master batches

Description:

Product Code	Matrix Resin	Matrix Resin Loading	Rubber	Rubber Loading	CNTs Code	CNTs Loading
TN-COC-(NSR)TNHIPS	HIPS HIE	80wt%	SBS	10wt%	P/C: TN-COC-(NSR)TNIM4	10wt%

-TN HIPS was diluted by HIE using twin-screw extruder, then the specimens were made by compression moulding. The standard of mechanical property of specimens was ISO 527, ISO 180 and ISO 178. Volume and surface resistivity were measured by high insulation resistance instrument ZC-90D（IEC 60093-1980, the test voltage is 100V)

CNTs Loading （wt% WT）	0	1	1.5
Volume Resistivity (ohm.cm)	$>10^{14}$	1.4×10^{13}	3.7×10^{8}
Surface Resistivity (ohm)	$>10^{14}$	3×10^{10}	5×10^{7}
Tensile Strength （MPa）	28.2	28.9	29.3
Stain at break（%）	39	29.1	28.3
Izod Notched Impact Strength （KJ/m²）	10.5	10.2	9.9
Flexural Strength （MPa）	44.3	45.4	45.9
Flexural Modulus （MPa）	2136	2246	2254
Melt Index （g/10min，5Kg/200℃）	2.7	3.32	3.05

d. CNTs/LLDPE Master batches

Description:

Product Code	Matrix Resin	Matrix Resin Loading	CNTs Code	CNTs Loading
TN-COC-(NSR)TNLLDPE	LLDPE 7042	80~85wt%	P/C: TN-COC-(NSR)TNIM4	15~20wt%

-TNLLDPE was diluted by HDPE 5000s using twin-screw extruder, then the specimens were made by compression moulding. The standard of mechanical property of specimens was ISO 527, ISO 180 and ISO 178. Volume and surface resistivity were measured by high insulation resistance instrument ZC-90D（GB/T1406-2006, the test voltage is 100V).

CNTs Loading （wt%）	2.5	3.5
Volume Resistivity (ohm.cm)	4×10^{14}	1.9×10^{9}
Surface Resistivity (ohm)	9.1×10^{11}	1.2×10^{7}
Tensile Strength （MPa）	25.1	24.5
Stain at break（%）	297.4	354
Izod Notched Impact Strength （KJ/m^2）	21.4	18.9
Flexural Strength （MPa）	21.6	21.2
Flexural Modulus （MPa）	740	680
Melt Index （g/10min，2.16Kg/190℃）	0.91	0.84

e. CNTs/PP Master batches

Description:

Product Code	Matrix Resin	Matrix Resin Loading	CNTs Code	CNTs Loading
TN-COC-(NSR)TNPP	Homopolymer PP	80wt%	P/C: TN-COC-(NSR)TNIM4	20wt%

-TN PP was diluted by PP 300 using twin-screw extruder, then the specimens were made by compression moulding. Volume and surface resistivity were measured by high insulation resistance instrument ZC-90D（ IEC 60093-1980, the test voltage is 100V).

CNTs Loading （wt%）	1.5	2
Volume Resistivity (ohm.cm)	$>10^{14}$	3.3×10^{6}
Surface Resistivity (ohm)	1.6×10^{13}	2.2×10^{6}

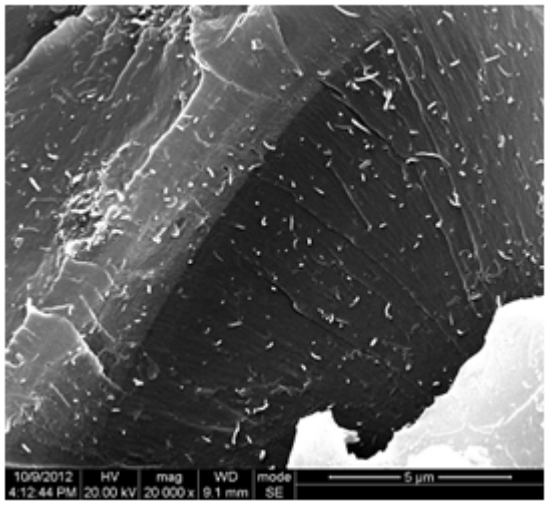
-TN PP was diluted by PP SP179 (copolymer, izod notched impact strength is about 40~45 KJ/m^2) using twin-screw extruder, then the specimens were made by injection moulding. The standard of mechanical property of specimens was ISO 527, ISO 180 and ISO 178.

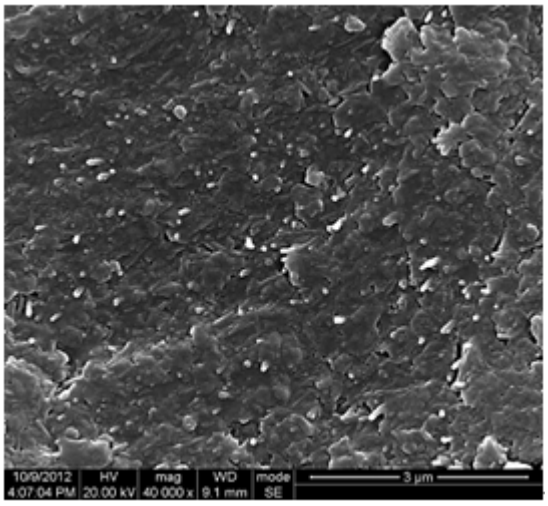
CNTs Loading （wt%）	0 （PP300 50%, SP179 50%）	6 （PP300 44%, SP179 50%）	8 （PP300 42%, SP179 50%）	10 （PP300 40%, SP179 50%）
Tensile Strength （MPa）	28.1	30	31.2	30.2
Stain at break （%）	49.4	36.9	43.6	41.4
Izod Notched Impact Strength （KJ/m^2）	9.2	18.4	33.4	47.3
Flexural Strength （MPa）	33.7	34.5	34.2	33.4
Flexural Modulus （MPa）	1139	1266	1254	1196
Melt Index （g/10min, 2.16Kg/230℃）	12.3	2.2	1.92	1.77

f. TNE51

In order to solve the problem of CNTs dispersion, promote the CNTs application in epoxy resins, we provide the CNTs epoxy composite, prepared by grinding.

Products Name	**COC-TNEPO**
Ingredient	CNTs/ Dispersant/ Epoxy resin
Composition (wt %)	4.5/2.4/93.1
MWNTs code	P/C: TN-COC-(NSR)TNIM8
Epoxy model number	D.E.R.™ 383 liquid bisphenol A epoxy resin, The DOW chemical company
D.E.R.™ 383 Epoxide equivalent weight (g/eq)	176-183
D.E.R.™ 383 Viscosity @ 25°C (mPa•s)	9000-10500





Carbon Nanotubes Functional Coating

a. CNTs Thermal Radiation Water-based Coating

CNTs thermal radiation water-based coating

CNTs, with high thermal conductivity and high radiation coefficient, is the ideal functional filler in thermal radiation coating

Products Name	TN-COC-(NSR)TNRC
Solid content (%)	15±1
Film-forming resin	polyurethane emulsion
CNTs content in coating layer (%)	20±1

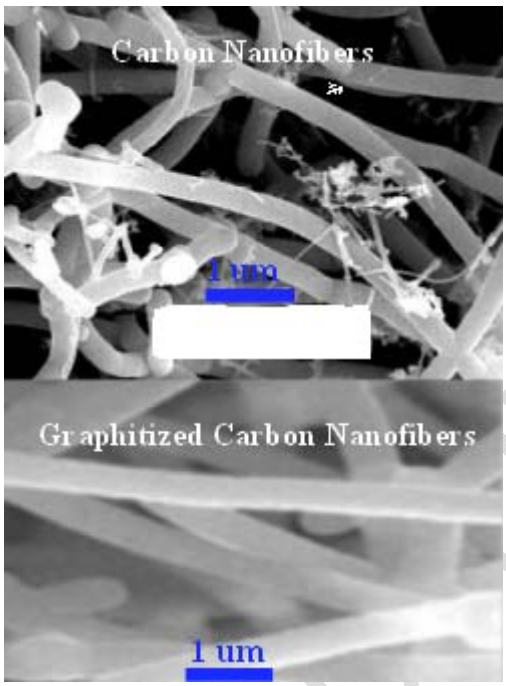
b. CNTs Transparent static conductive water-based coating

CNTs transparent static conductive water-based coating

CNTs, with small diameter and high conductivity are the ideal functional filler in transparent static conductive coating.

Products Name	**TN-COC-(NSR)TNTC**
Solid content (%)	2.0-2.2
Film-forming resin	polyurethane emulsion
CNTs content in coating layer (%)	20±1
Surface resistance(Ω/□)	10E5-10E6 80% transmittance including substrate

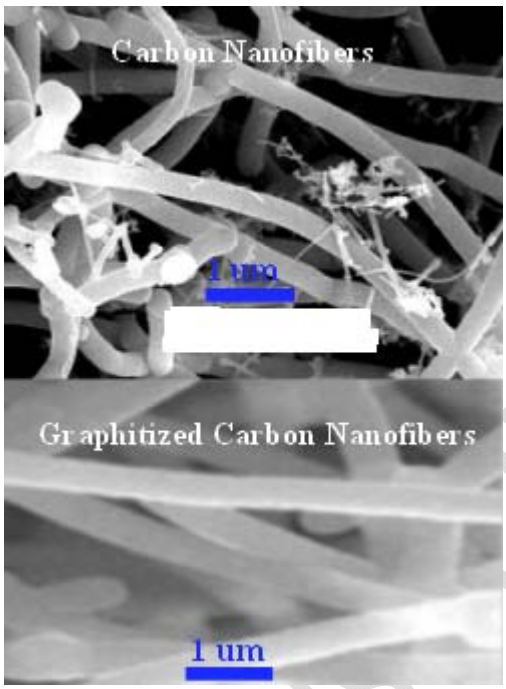
Carbon NanoFibers, Purity: >95%, OD: 200-600nm



Carbon Nano Fibers:
Purity: > 95 wt% carbon nano fibers (from TGA & TEM)
Outside Diameter: 200-600 nm (from HRTEM, Raman)
Length: 5-50 µm (TEM)
SSA: > 18 m2/g (BET)
Ash: < 5 wt% (TGA)
Color: Black
Electrical Conductivity: >100 s/cm
Tap Density: 0.043 g/cm3
True Density: 2.1 g/cm3
Manufacturing Method: CVD

Carbon NanoFibers Application
Potential applications of carbon nanofibers are: (1) additives in polymers; (2) catalysts; (3) electron field emitters for cathode ray lighting elements; (4) flat panel display; (5) gas-discharge tubes in telecom networks; (6) electromagnetic-wave absorption and shielding; (7) energy conversion; (8) lithium-battery anodes; (9) hydrogen storage; (10) nanotube composites (by filling or coating); (11) nanoprobes for STM, AFM, and EFM tips; (12) nanolithography; (13) nanoelectrodes; (14) drug delivery; (15) sensors; (16) reinforcements in composites; (17) supercapacitor.

Graphitized Carbon NanoFibers, Purity: >99.9%, OD: 200-600nm

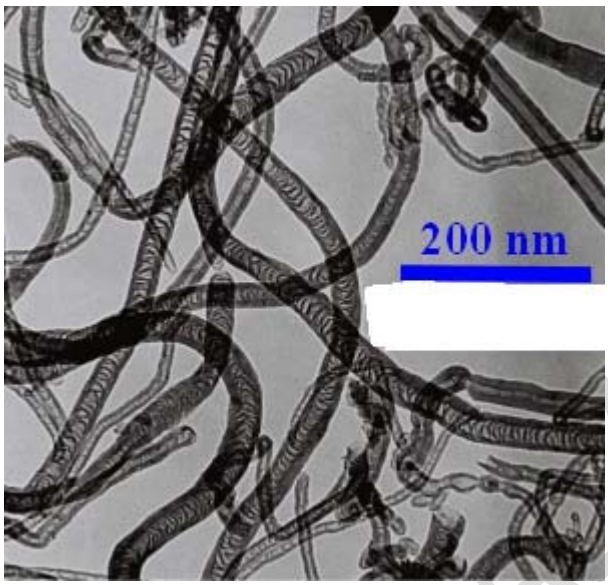


Graphitized Carbon NanoFibers
Purity: > 99.9 wt% carbon nano fibers (from TGA & TEM)
Outside Diameter: 200-600 nm (from HRTEM, Raman)
Length: 5-50 μm (TEM)
SSA: > 18 m2/g (BET)
Ash: < 0.1 wt% (TGA)
Color: Black
Electrical Conductivity: >100 s/cm
Tap Density: 0.043 g/cm3
True Density: 2.1 g/cm3
Manufacturing Method: CVD, processed at 2800 °C

Graphitized Carbon NanoFibers Product Description
Graphitized high purity carbon nanoFibers were produced by a low temperature CVD method and subsequently annealed about twenty (20) hours under condition of inert gas at temperature 2800°C. These products were characterized for chemical purity, and defect healing. The graphitization procedure was found to remove residual metal catalyst in the nanofibers and reduce the defects. The graphitized carbon nanoFibers have the highest graphite crystallization, the high electrical conductivity, thermal conductivity and the excellent inoxidizability. The electrical conductivity of the graphitized carbon nanoFibers is very close to that of graphite powder. And its ignition temperature can reach 800°C.

Graphitized Carbon NanoFibers Application
Potential applications of carbon nanofibers are: (1) additives in polymers; (2) catalysts; (3) electron field emitters for cathode ray lighting elements; (4) flat panel display; (5) gas-discharge tubes in telecom networks; (6) electromagnetic-wave absorption and shielding; (7) energy conversion; (8) lithium-battery anodes; (9) hydrogen storage; (10) nanotube composites (by filling or coating); (11) nanoprobes for STM, AFM, and EFM tips; (12) nanolithography; (13) nanoelectrodes; (14) drug delivery; (15) sensors; (16) reinforcements in composites; (17) super capacitor.

Research Grade Nitrogen-doped Carbon Nanotubes / MWCNTs Doped with N

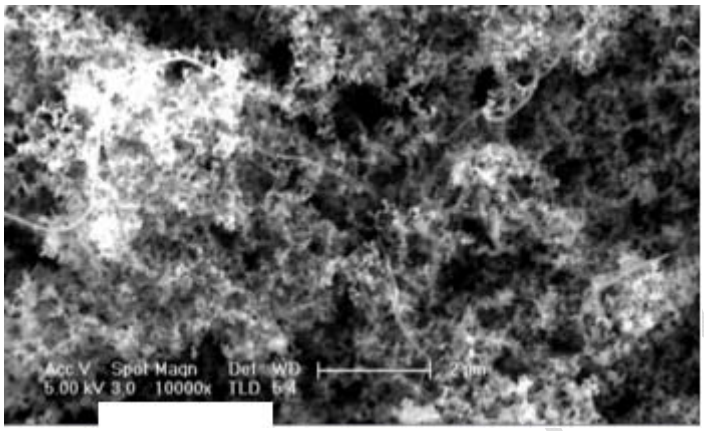


Research Grade MWCNTs Doped with Nitrogen
MWCNTs Purity:>98%
MWCNTs N Doped Purity:>95%
Content of N: 3-5wt%
Outer Diameter: 20-50nm
Inner Diameter: 5-15nm
Length: ~35um
SSA: >95m2/g
Color: Black
Tap density: 0.265g/cm3
Electric Conductivity:>100s/cm
Making Method: CVD
MWCNTs Doped with Nitrogen

Research Grade Nitrogen-Doped Carbon Nanotubes / MWCNTs Doped with N Application:
Potential Applications of Carbon Nanotubes; Additives in polymers; Catalysts; Electron field emitters for cathode ray lighting elements; flat panel display; gas-discharge tubes in telecom networks; Electromagnetic-wave absorption and shielding; Energy conversion; Lithium-battery anodes; Hydrogen storage; Nanotube composites (by filling or coating); Nanoprobes for STM, AFM, and EFM tips; nanolithography; nanoelectrodes; drug delivery; sensors; Reinforcements in composites; Super capacitor...

Super Conductive Carbon Black Nanopowder and Carbon Nanotube Mixed

Properties: Higher electrode conductivity and stronger electrode mechanical strength and adhesive attraction; The product is composed of high electric conductive CNTs and a kind of carbon black. The carbon black nanoparticles can not only prevent dispersed CNTs from agglomerating, but also exhibit synergetic effect with CNTs.

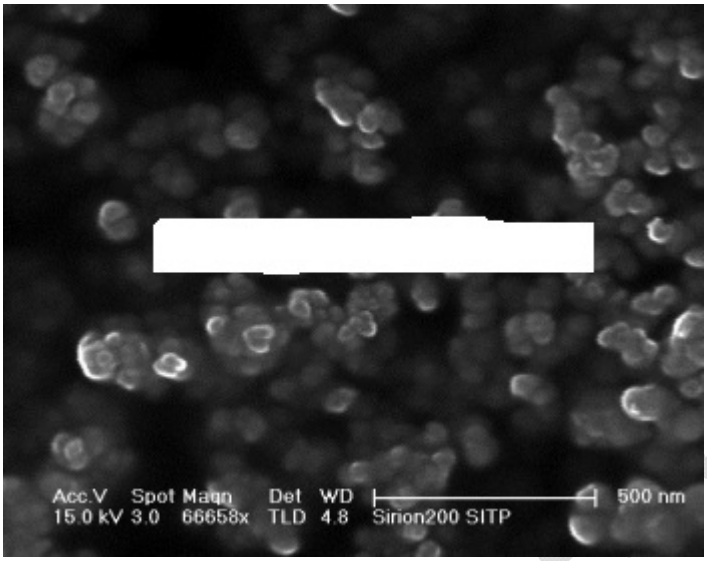


Super Conductive Carbon Black Nanopowder and Carbon Nanotube Mixed
Carbon Nanotube: Outside diameter (D50): 30-100 nm; Length: 5-30 um; SSA: > 100 m2/g
Carbon Black Nanopowder APS: 5nm-100nm
Appearance: Black Powder
PH Value: 8-10
Tap density: 0.15 g/cm3
Adsorption value: >530 ml/100g
Volume resistivity: 2~5 x 10-4 Ω·cm

Moisture	Ash	C	Ni	Mg	Fe	PH
0.2%	0.2%	>95%	<0.05%	35ppm	30ppm	8-10

Super Conductive Carbon Black Nanopowder and Carbon Nanotube Mixed Dosage:
Recommended dosage is usually 1 to 3wt%, Users should be based on different systems to test, and then determine the best dosage for the best use.

Conductive Carbon Black Nanopowder / Nanoparticles (C, 150 nm, Plant as Raw Materials)



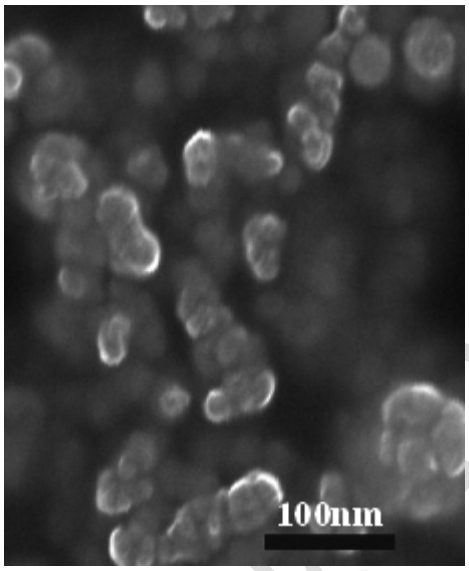
Morphology: spherical
Purity: >95%
Color: Black
APS: 150nm
H2O: <5%
Ash: <3.2%
PH: 9.80
True Density: 0.38g/ml
Electrical Conductivity: 0.30 Ω.cm

Carbon Black Nanopowder Product Features:
Our company's Conductive Carbon Black Nanopowder is produced by selecting perennial mountain trees as row materials, through high temperature (1300oC) carbonization, ultra-fine nano-grinding, therefore, the nanopowder possesses the following features: Powerful specific surface Area (SSA>700m2/g); Electrical conductivity (0.30Ω.cm); Easy to be dispersed...

Carbon Black Nanopowder Applications:
It can be used for plastics, rubber, electronics technology, anti-static materials. It is all-natural, non-polluting material - It is the real green conductive material..

Carbon Black Nanopowder Storage Conditions:
Damp reunion will affect its dispersion performance and using effects, therefore, this product should be sealed in vacuum and stored in cool and dry room and it should not be exposure to air. In addition, the product should be avoided under stress.

Super Activated Porous Carbon (C) Nanopowder / Nanoparticles (C, 20-40nm, Plant as Raw Materials)



Morphology: spherical
Color: Black
Decoloration Rate: 99%
Purity: >95%
Cobalt-60 Radiation Sterilization
APS: 20-40nm
H2O: <5%
Ash: <2%
PH: 7-10
True density: 0.44g/ml
Bulk density: 0.32g/ml
Activated Porous Carbon Nanopowder, Activated Porous Carbon Nanoparticles

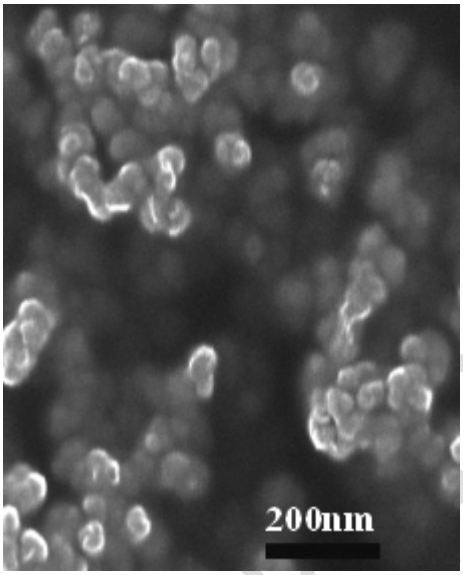
Activated Porous Carbon Nanoparticles Product Features:
Our company's natural plant porous nano-carbon powder is produced by selecting perennial mountain bamboo and holly trees as row materials, through high temperature carbonization, ultra-fine nano-grinding, cobalt-60 radiation sterilization, therefore, the nanopowder possesses the following features: Powerful specific surface area (SSA>1400m2/g); Electrical conductivity (0.2 Ω.cm); high activation; Easy to disperse; Powerful iodine adsorption (absorption capability >1350mg/g); Methylene blue number >280mg/g; Negative-ions concentration 7150/cm3; Far Infrared emission rate 91%.

Activated Porous Carbon Nanoparticles Applications:
It can be used for medicine, food, cosmetics, health products and functional materials...

Activated Porous Carbon Nanoparticles Storage Conditions:
Damp reunion will affect its dispersion performance and using effects, therefore, this product should be sealed in vacuum and stored in cool and dry room and it should not be exposure to air. In addition, the product should be avoided under stress.

Activated Porous Carbon Nanoparticles Frequently Asked Questions:
"Activated Carbon", also called activated charcoal or activated coal is a form of carbon that has been processed to make it extremely porous and thus to have a very large surface area available for adsorption or chemical reactions
1) What is the carbonization temperature for these products? --- 1000-1300 °C (Material with carbon content is pyrolyzed at temperatures in the range 1000–1300 °C, in absence of oxygen)
2) Activation: what type of activation was performed? --- Physical activation—Raw material or Carbonized material is exposed to steam at temperatures about 1000°C.
3) What are the pore sizes of these porous carbons? --- 2-50nm
4) Are the pores inside individual carbon nanoparticle interconnected? -- By random, some of the pores are interconnected, the others are not.
5) What are the pore volumes of these porous carbons? --- 1.1-1.3 cm3/g

Super Activated Porous Carbon (C) Nanopowder / Nanoparticles (C, 60-80nm, Plant as Raw Materials)



Morphology: spherical
Color: Black
Decoloration Rate: 99%
Purity: >95%
Cobalt-60 Radiation Sterilization
APS: 60-80nm
H2O: <5%
Ash: <2%
PH: 7-10
True density: 0.46g/ml
Bulk density: 0.34g/ml

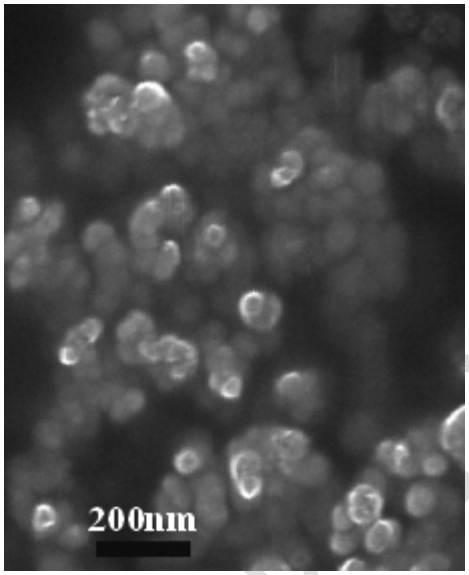
Activated Porous Carbon Nanoparticles Product Features:
Our company's natural plant porous nano-carbon powder is produced by selecting perennial mountain bamboo and holly trees as row materials, through high temperature carbonization, ultra-fine nano-grinding, cobalt-60 radiation sterilization, therefore, the nanopowder possesses the following features: Powerful specific surface Area (SSA>1350m2/g); Electrical conductivity (0.2 Ω.cm); high activation; Easy to disperse; Powerful iodine adsorption (absorption capability >1300mg/g); Methylene blue number >270mg/g; Negative-ions concentration 7150/cm3; Far Infrared emission rate 92%.

Activated Porous Carbon Nanoparticles Applications:
It can be used for medicine, food, cosmetics, health products and functional materials

Activated Porous Carbon Nanoparticles Storage Conditions:
Damp reunion will affect its dispersion performance and using effects, therefore, this product should be sealed in vacuum and stored in cool and dry room and it should not be exposure to air. In addition, the product should be avoided under stress.

Activated Porous Carbon Nanoparticles Frequently Asked Questions:
"Activated Carbon", also called activated charcoal or activated coal is a form of carbon that has been processed to make it extremely porous and thus to have a very large surface area available for adsorption or chemical reactions
1) What is the carbonization temperature for these products? --- 1000-1300 °C (Material with carbon content is pyrolyzed at temperatures in the range 1000–1300 °C, in absence of oxygen)
2) Activation: what type of activation was performed? --- Physical activation—Raw material or Carbonized material is exposed to steam at temperatures about 1000°C.
3) What are the pore sizes of these porous carbons? --- 2-50nm
4) Are the pores inside individual carbon nanoparticle interconnected? -- By random, some of the pores are interconnected, the others are not.
5) What are the pore volumes of these porous carbons? --- 1.1-1.3 cm3/g

Super Activated Carbon (C) Nanopowder / Nanoparticles (C, <100nm, Coconut Shell as Raw Materials)



Super Activated Carbon Nanopowder (C, Coconut Shell as Raw Materials)
Morphology: spherical
Decoloration rate: 99%
Purity: >95%
Color: Black
APS: <100 nm
H2O: <5%
Ash: <2%
PH: 7-10
True density:0.42g/ml
Bulk Density:0.28g/ml

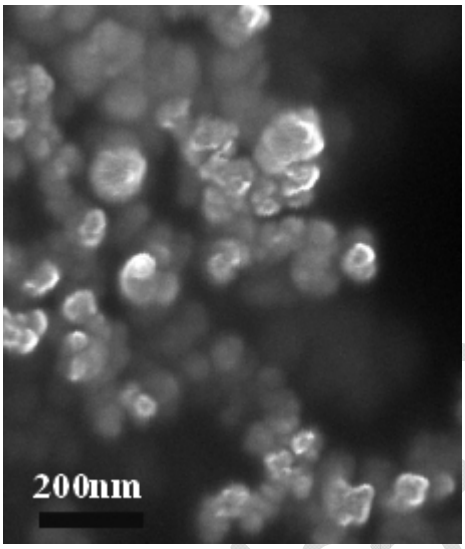
Activated Carbon Nanoparticles Product Feature:
The Super Activated Carbon Nanopowder is made from a selection of Indonesian coconut shell charcoal through special carbonization, activation, grinding and classification, therefore, the nanopowder possesses the following features: Powerful specific surface Area (SSA>1300m2/g); Electrical conductivity (0.4Ω.cm); high activation; Easy to disperse; Powerful iodine adsorption (absorption capability >1250mg/g); Methylene blue number >260mg/g; Negative-ions concentration 7150/cm3; Far Infrared emission rate 91%.

Activated Carbon Nanoparticles Application:
Mainly used in military industry, aviation and aerospace, textile, rubber, functional materials, chemical industry, food, pharmaceutical, electronics technology, environmental protection, etc.

Activated Carbon Nanoparticles Storage Conditions:
Damp reunion will affect its dispersion performance and using effects, therefore, this product should be sealed in vacuum and stored in cool and dry room and it should not be exposure to air. In addition, the product should be avoided under stress.

Activated Carbon Nanoparticles Frequently Asked Questions:
"Activated Carbon", also called activated charcoal or activated coal is a form of carbon that has been processed to make it extremely porous and thus to have a very large surface area available for adsorption or chemical reactions
1) What is the carbonization temperature for these products? --- 1000-1300 °C (Material with carbon content is pyrolyzed at temperatures in the range 1000–1300 °C, in absence of oxygen)
2) Activation: what type of activation was performed? --- Physical activation—Raw material or Carbonized material is exposed to steam at temperatures about 1000 °C.
3) What are the pore sizes of these porous carbons? --- 2-50nm
4) Are the pores inside individual carbon nanoparticle interconnected? -- By random, some of the pores are interconnected, the others are not.
5) What are the pore volumes of these porous carbons? --- 1.1-1.3 cm3/g

Super Activated Carbon (C) Nanopowder / Nanoparticles (C, <100nm, Bamboo as Raw Materials)



Super Activated Carbon Nanopowder (C, <100nm, Bamboo as Raw Materials)
Morphology: spherical
Decoloration rate: 99%
Purity: >95%
Color: Black
APS: <100 nm
H2O: <5%
Ash: <2%
PH: 7-10
True density: 0.43g/ml
Bulk density: 0.3g/ml

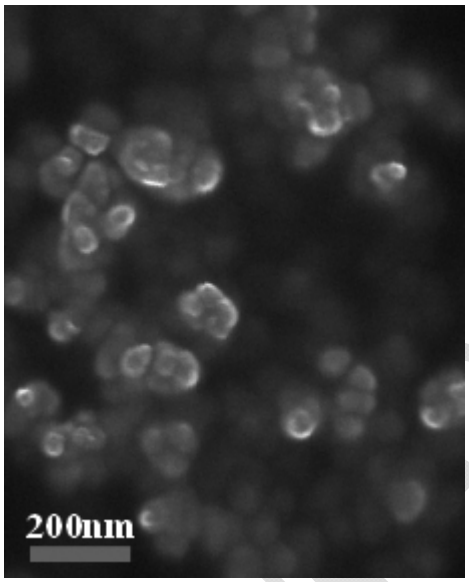
Activated Carbon Nanoparticles Product Feature:
The Super Activated Carbon Nanopowder is made from a selection of high temperature bamboo charcoal through special carbonization, activation, grinding and classification, therefore, the nanopowder possesses the following features: Powerful specific surface Area (SSA>1000m2/g); Electrical conductivity (0.4Ω.cm); high activation; Easy to disperse; Powerful iodine adsorption (absorption capability >1000mg/g); Methylene blue number >240mg/g; Negative-ions concentration 7150/cm3; Far Infrared emission rate 91%.

Activated Carbon Nanoparticles Application:
Mainly used in military industry, aviation and aerospace, textile, rubber, functional materials, chemical industry, food, pharmaceutical, electronics technology, environmental protection, etc.

Activated Carbon Nanoparticles Storage Conditions:
Damp reunion will affect its dispersion performance and using effects, therefore, this product should be sealed in vacuum and stored in cool and dry room and it should not be exposure to air. In addition, the product should be avoided under stress.

Activated Carbon Nanoparticles Frequently Asked Questions:
"Activated Carbon", also called activated charcoal or activated coal is a form of carbon that has been processed to make it extremely porous and thus to have a very large surface area available for adsorption or chemical reactions
1) What is the carbonization temperature for these products? --- 1000-1300 °C (Material with carbon content is pyrolyzed at temperatures in the range 1000–1300 °C, in absence of oxygen)
2) Activation: what type of activation was performed? --- Physical activation—Raw material or Carbonized material is exposed to steam at temperatures about 1000°C.
3) What are the pore sizes of these porous carbons? --- 2-50nm
4) Are the pores inside individual carbon nanoparticle interconnected? - By random, some of the pores are interconnected, the others are not.
5) What are the pore volumes of these porous carbons? --- 1.1-1.3 cm3/g

Super Activated Carbon (C) Nanopowder / Nanoparticles (C, <100nm, Charcoal as Raw Materials)



Super Activated Carbon Nanopowder (C, <100nm, Charcoal as Raw Materials)
Morphology: spherical
Decoloration rate: 99%
Purity: >95%
Color: Black
APS: <100 nm
H2O: <5%
Ash: <2%
PH: 7-10
True density: 0.45g/ml
Bulk density: 0.33g/ml

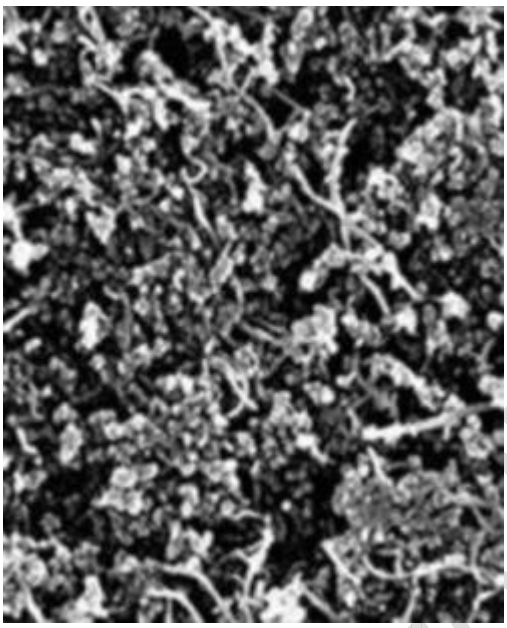
Activated Carbon Nanoparticles Product Features:
The Super Activated Carbon Nanopowder is made from a selection of high temperature superfine charcoal through special carbonization, activation, grinding and classification, therefore, the nanopowder possesses the following features: Powerful specific surface Area (SSA>300m2/g); Electrical conductivity (0.2Ω.cm); high activation; Easy to disperse; Powerful iodine adsorption (absorption capability >300mg/g); Methylene blue number >160mg/g; Negative-ions concentration 7150/cm3; Far Infrared emission rate 92%.

Activated Carbon Nanoparticles Applications:
Mainly used in military industry, aviation and aerospace, textile, rubber, functional materials, chemical industry, food, pharmaceutical, electronics technology, environmental protection, etc.

Activated Carbon Nanoparticles Storage Conditions:
Damp reunion will affect its dispersion performance and using effects, therefore, this product should be sealed in vacuum and stored in cool and dry room and it should not be exposure to air. In addition, the product should be avoided under stress.

Activated Carbon Nanoparticles Frequently Asked Questions:
"Activated Carbon", also called activated charcoal or activated coal is a form of carbon that has been processed to make it extremely porous and thus to have a very large surface area available for adsorption or chemical reactions
1) What is the carbonization temperature for these products? --- 1000-1300 °C (Material with carbon content is pyrolyzed at temperatures in the range 1000–1300 °C, in absence of oxygen)
2) Activation: what type of activation was performed? --- Physical activation—Raw material or Carbonized material is exposed to steam at temperatures about 1000 °C.
3) What are the pore sizes of these porous carbons? --- 2-50nm
4) Are the pores inside individual carbon nanoparticle interconnected?--By random, some of the pores are interconnected, the others are not.
5) What are the pore volumes of these porous carbons? --- 1.1-1.3 cm3/g

Super Activated Carbon Nanoparticles and Carbon Nanotubes Mixed



Super Activated Carbon Nanoparticles and Carbon Nanotube Mixed--It is a supercapacitor carbon nanotube composite electrode material--It is easy to be dispersed.

The Product Features:
1) It is a supercapacitor carbon nanotube composite electrode material; 2) Super capacity characteristics; very excellent high power characteristics; 3) Powerful iodine adsorption capability; 4) Powerful specific surface area.

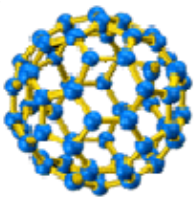
The Product Application:
Mainly used in super-capacitor device and in military industry, aviation and aerospace, textile, rubber, functional materials, chemical industry, food, pharmaceutical, electronics technology, environmental protection, etc.

The Product Storage Conditions:
Damp reunion will affect its dispersion performance and using effects, therefore, this product should be sealed in vacuum and stored in cool and dry room and it should not be exposure to air. In addition, the product should be avoided under stress.

Carbon Nanotube: Outside diameter (D50): 30-100 nm; Length: 5-30 um; SSA: > 100 m2/g
Activated Carbon Nanoparticles APS: 80nm
Appearance: Black Powder
PH Value: 5-8

Bulk Density (g/cc)	Ash %	SSA (m^2/g)	Pore volume (cm^3/g)	Pore diameter (nm)	Iodine adsorption (mg/g)	C	Ions from ICP(ICP) (ppm)	Organic capacitance (F/g)
0.32-0.40	<0.08	1800-2200	0.75-1	2-3	2100	>98	<1000	>140

Fullerene



The discovery of fullerenes in 1985 led to a new field of study and a New Material Class of pure carbon that is significantly different from other forms of carbon, diamond and graphite. Carbon Fullerenes are spherical, caged molecules with carbon atoms located at the corner of the polyhedral structure consisting of pentagons and hexagons, much like the shape of a Soccer ball. Carbon Fullerenes come in many forms, the most abundant form is Carbon 60 (which has a soccer ball shape), Carbon 70 (which has more of a rugby ball shape) and Carbon 84 (spherical). Fullerene get the name from the geodesic dome shape which was research and promoted by Buckminister Fuller. Following the discovery of Fullerenes another new carbon structure known as Carbon Nanotubes was discovered. Nanotubes are seamless cylinders of hexagonal carbon networks (tubes) that are formed either as a Single wall molecule or Multiwalled molecules.

Catalog #	**Carbon 60 99.0%**
SESR-(NSR)600-9900-5G/C60	Carbon 60, 99.0 %, 5 grams HPLC tested.
Catalog #	**Carbon 60 99.5%**
SESR-(NSR)600-9950-1KG/C60	Carbon 60, 99.5+ %, reagent, 1 kg
SESR-(NSR)600-9950-1G/C60	Carbon 60, 99.5+ %, reagent, 1 g
SESR-(NSR)600-9950-5G/C60	Carbon 60, 99.5+ %, reagent, 5 g
SESR-(NSR)600-9950-10G/C60	Carbon 60, 99.5+ %, reagent, 10 g
SESR-(NSR)600-9950-25G/C60	Carbon 60, 99.5+ %, reagent, 25 g
SESR-(NSR)600-9950-50G/C60	Carbon 60, 99.5+ %, reagent, 50 g
SESR-(NSR)600-9950-100G/C60	Carbon 60, 99.5+ %, reagent, 100 g
SESR-(NSR)600-9950-250G/C60	Carbon 60, 99.5+ %, reagent, 250 g
Catalog #	**Carbon 60 99.9%**
SESR-(NSR)600-9969-1G/C60	Carbon 60, 99.9+ %, purified, 1 g
SESR-(NSR)600-9969-5G/C60	Carbon 60, 99.9+ %, purified, 5 g
SESR-(NSR)600-9969-10G/C60	Carbon 60, 99.9+ %, purified, 10 g
SESR-(NSR)600-9969-25G/C60	Carbon 60, 99.9+ %, purified, 25 g
SESR-(NSR)600-9969-50G/C60	Carbon 60, 99.9+ %, purified, 50 g
SESR-(NSR)600-9969-100G/C60	Carbon 60, 99.9+ %, purified, 100 g
SESR-(NSR)600-9969-250G/C60	Carbon 60, 99.9+ %, purified, 250 g
Catalog #	Carbon 60 99.95%
SESR-(NSR)600-9980-1G/C60	Carbon 60, 99.95+ %, ultra pure Vacuum oven dried, 1 g
SESR-(NSR)600-9980-5G/C60	Carbon 60, 99.95+ %, ultra pure Vacuum oven dried, 5 g
SESR-(NSR)600-9980-10G/C60	Carbon 60, 99.95+ %, ultra pure Vacuum oven dried, 10 g
SESR-(NSR)600-9980-25G/C60	Carbon 60, 99.95+ %, ultra pure Vacuum oven dried, 25 g
SESR-(NSR)600-9980-50G/C60	Carbon 60, 99.95+ %, ultra pure Vacuum oven dried, 50 g

SESR-(NSR)600-9980-100G/C60	Carbon 60, 99.95+ %, ultra pure Vacuum oven dried, 100 g
Catalog #	Carbon 70 98.0%
SESR-(NSR)700-9854-1G/C70	Carbon 70, 98.0+ %, 1 gram
SESR-(NSR)700-9854-5G/C70	Carbon 70, 98.0+ %, 5 grams
SESR-(NSR)700-9854-10G/C70	Carbon 70, 98.0+ %, 10 grams
SESR-(NSR)700-9854-50G/C70	Carbon 70, 98.0+ %, 50 grams
SESR-(NSR)700-9854-100G/C70	Carbon 70, 98.0+ %, 100 grams
SESR-(NSR)700-9854-200G/C70	Carbon 70, 98.0+ %, 200 grams
SESR-(NSR)700-9854-250G/C70	Carbon 70, 98.0+ %, 250 grams
SESR-(NSR)700-9854-500G/C70	Carbon 70, 98.0+ %, 500 grams
SESR-(NSR)700-9854-1K/C70	Carbon 70, 98.0+ %, 1 kilograms
Catalog #	Carbon 70 99.0%
SESR-(NSR)700-9999-1G/C70	Carbon 70, 99.0%, 1 gram
SESR-(NSR)700-9999-5G/C70	Carbon 70, 99.0%, 5 gram
SESR-(NSR)700-9999-10G/C70	Carbon 70, 99.0+ %, 10 grams
SESR-(NSR)700-9999-50G/C70	Carbon 70, 99.0+ %, 50 grams
SESR-(NSR)700-9999-100G/C70	Carbon 70, 99.0+ %, 100 grams
SESR-(NSR)700-9999-250G/C70	Carbon 70, 99.0+ %, 250 grams
Catalog #	Carbon 84 95.0%
SESR-(NSR)849-9550/C84	Carbon 84, 95.0+ %, reagent, 10 mg
Catalog #	Carbon 84 98.0%
SESR-(NSR)849-9800/C84	Carbon 84, 98.0+ %, purified, 10 mg
Catalog #	Carbon 84 99.0%
SESR-(NSR)849-9910/C84	Carbon 84, 99.0+ %, 10 mg
Catalog #	Fullerene Extract
SESR-(NSR)300-6070-5G/C60/C70	C60/C70, Approx. 70% C60, 28% C70, 2% higher, 5 grams
SESR-(NSR)300-6070-10G/C60/C70	C60/C70, Approx. 70% C60, 28% C70, 2% higher, 10 grams
SESR-(NSR)300-6070-50G/C60/C70	C60/C70, Approx. 70% C60, 28% C70, 2% higher, 50 grams
SESR-(NSR)300-6070-100G/C60/C70	C60/C70, Approx. 70% C60, 28% C70, 2% higher, 100 grams
SESR-(NSR)300-6070-250G/C60/C70	C60/C70, Approx. 70% C60, 28% C70, 2% higher, 250 grams
SESR-(NSR)300-6070-500G/C60/C70	C60/C70, Approx. 70% C60, 28% C70, 2% higher, 500 grams

NovaScientific

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