

## **China Nanotech Start-up: ShenZhen Nanoport**

### *Creating China CNT Nanotech Network*

There are over 20 research institutions and companies in China actively pursuing Carbon Nanotube R & D. The number of Nanotech start-ups in China has been rising quite drastically since 2000. Hightech companies in China are generally funded by local investors, IPO companies, local regional governments, the Ministry of Science and Technology (MOST) and Hong Kong and Taiwan large corporations. The ShenZhen Nanoport (NTP) was founded in 2001 by a team of academic entrepreneurs of the Chinese Academy of Sciences (CAS) and Shenzhen city local investors, strategically located at the Shen Zhen Hightech Park (border city of China right next to Hong Kong) with its manufacturing base located at Wuhan inland of China. The main share holders of NTP is the Chinese Academia of Sciences and HuiHeng Investment Ltd (a Shenzhen local investment firm specializing in investing education infrastructures and hightech companies in Shenzhen).

The Chief Scientist of NTP is Prof. ZuoLong Yu who was the former Director of the Institute of Organic Chemistry ChengDu Chinese Academy of Sciences in ChengDu (Capital City of the SiCuan Province). Prof. Yu is one of the top scientists in China specializing in Carbon Nanotube synthesis and industry applications. Prof. Yu has 30 years research experience and has been project leaders of a number of National `Eight-five` and `Nine-five` programs. He has received a number of awards for his research achievement in both science and industry applications. He has published over 30 papers related to CNT and has 8 Chinese patents.

He and his research team have developed the `Fluidised-Bed Processing for Mass Producing Carbon Nanotubes by Catalyst Method` and `Moving-Bed Processing for Continuous Producing Carbon Nanotubes by Catalyst Method` which are the core technologies of NTP for mass-producing Carbon Nanotubes including multi wall, single wall and double wall CNT with controlled sizes and characteristics.

His group has also shown early on that CNT can be the micro-wave absorbant and further demonstrated the broadband electromagnetic wave absorption properties.

NTP demonstrated the order of tons annual production of Multi Wall Carbon Nanotubes (MWCNT) since 2001 and has been recognized as one of the leading CNT manufacturers in the world. Recently NTP is able to produce very high quality Single Wall CNT and Double Wall CNT with large quantity. It also appears as an emerging new nanotech start-up in China which aggressively reaching out both nationally and internationally in developing its global competitive technologies and products particularly in the field of carbon nanotubes synthesis and applications.

NTP started with about 10 people and now has grown to 40 staff with over 60% researchers.

It has established strong collaborations including joint research projects with leading universities and companies worldwide. NTP is able to mass produce CNT in various forms and characteristics and has been providing samples to worldwide research institutions and establishing research collaborations. NTP recognizes the stage of CNT development is not yet profitable and it intends to focus on research and sharing research results with worldwide leaders in the field to accelerating the commercialization process globally. Meanwhile it also initiated collaborations with

large industries for developing applications of CNT. Industries in China are closely watching NTP's CNT R & D.

NTP aims to become Carbon Nanotube R & D and commercialization portal in China connecting with leaders both nationally and internationally. It is the most open and visionary company in CNT and related nanotechnology R & D in China.

It actively integrates universities, national labs and industries to ensure its leadership in research and the immediate access to industry applications. Mr. Zhen-Wen Li, the Vice-president of NTP (also a director) responsible for Technology Development & Marketing of the company said to the author during the interview, "We are experimenting a brand new business model of China's High-tech companies by collaborating with the global leaders in CNT Nanotechnology and we are the only company in China which is actively building a carbon nanotube global network and promoting the commercial applications of CNT. We are very fortunate and grateful for the strong support both from the central government and the local government of Shenzhen. Nanotechnology is still in its infancy and government support for R & D for start-ups like NTP is very essential for us to survive. So far our main funding for research comes from the central government and local Shenzhen government with total amount about USD 1 million". The Chief Information Officer Ms Christine Zhang said, "Since the founding of NTP in 2001, we have not only advanced our technology and acquired new patents, we have also established global collaborations through supplying CNT samples and joint research with leaders in CNT fields including National University of Singapore, Hong Kong University of Science and Technology, University of Southern California, University of Tsukuba and a number of research institutions and companies in Japan, USA and Europe."

**Awarded Projects to NTP (In total amount of about 1million USD) is summarized in the following table:**

Project/Award Name	Funding Body	Period	Partner
Shenzhen Enterprise Technology Centre	Shenzhen Regional Government	2001	NA
Research on the Synthesis of Carbon Nanotubes With Annual Production Five Tons	Shenzhen Science and Technology Plan, Shenzhen Regional Government	2001	NA
Conductive Coating Materials Development Using Carbon Nanotubes as Conductors	863 National Program Funded by MOST, Central Government	2002-2005	CAS
Mass Production of Conductive Coating Materials using Carbon Nanotubes and Related Products	Shenzhen Hi-tech Industrialization Demonstration Engineering Program, ShenZhen Regional Government	2002	NA

Note:

CAS-Chinese Academy of Sciences

863 National Program- Chinese National High-tech R & D Program focusing on Applied Research

MOST-Chinese Ministry of Science and Technology

The Main Technologies of NTP can be summarized as:

1. Continuous batch process of various standards carbon nanotubes (core technology and patented in China)
2. Dispersing technology of carbon nanotubes (well-developed)
3. Applied technology for carbon nanotubes in coating industry (863 project jointly developed with CAS)
4. Applied technology for carbon nanotubes in plastic industry (currently being developed)

NTP is also aggressive marketing its products and in the process developing its global network. Their main products include:

1. Single wall carbon nanotubes.
2. Double wall carbon nanotubes.
3. Multi wall carbon nanotubes.
4. Light color/color anticorrosive electrostatic conductive coating.
5. CNTs-filled master batches for electrically conductive PC (under developing)
6. CNTs-filled master batches for electrically conductive PA66(under developing)
7. CNTs-filled master batches for electrically conductive PEEK (under developing)

The management of NTP is the following:

Managing Director **Professor Yun-Shi Wang**  
 Chief Scientist **Professor Zuo-Long Yu**  
 Technology Development & Marketing **Mr Zhen-Wen Li**  
 Chief Information Officer **Ms Christine Zhang**

The figure shows the TEM image of Double Wall CNT using the best TEM in the CAS headquarter in Beijing. The characteristics of The DWCNT is summarized in the following table:

Items	Description	Testing methods
Internal Diameter	1.3-2.0nm	TEM
External Diameter	<5nm	TEM
Purity	50%~80%	TEM, TPO
Amorphous Carbon	<5%	TPO
Ash(Co,Mo)	1~2wt%	TGA
Length	0.5~50um	TEM, SEM
Special Surface Area	>500m <sup>2</sup> /g	BET

