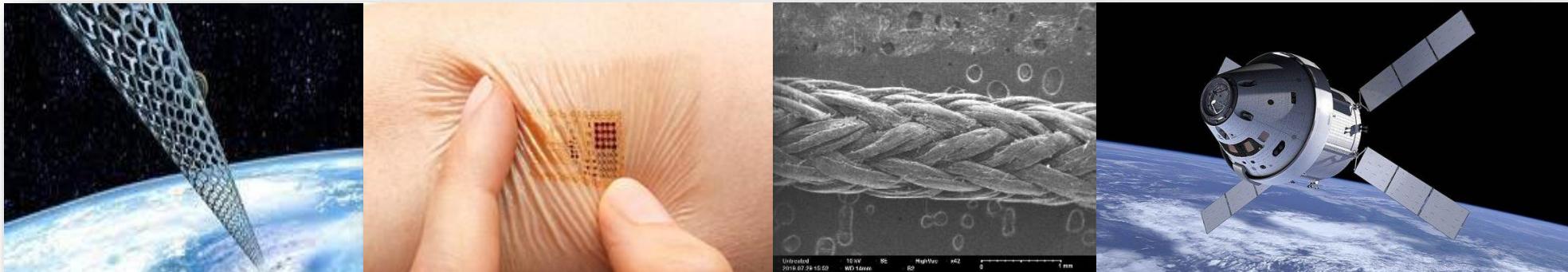




CARBON NANOTUBE BASED FIBERS/YARNS WITH SUPERIOR PROPERTIES



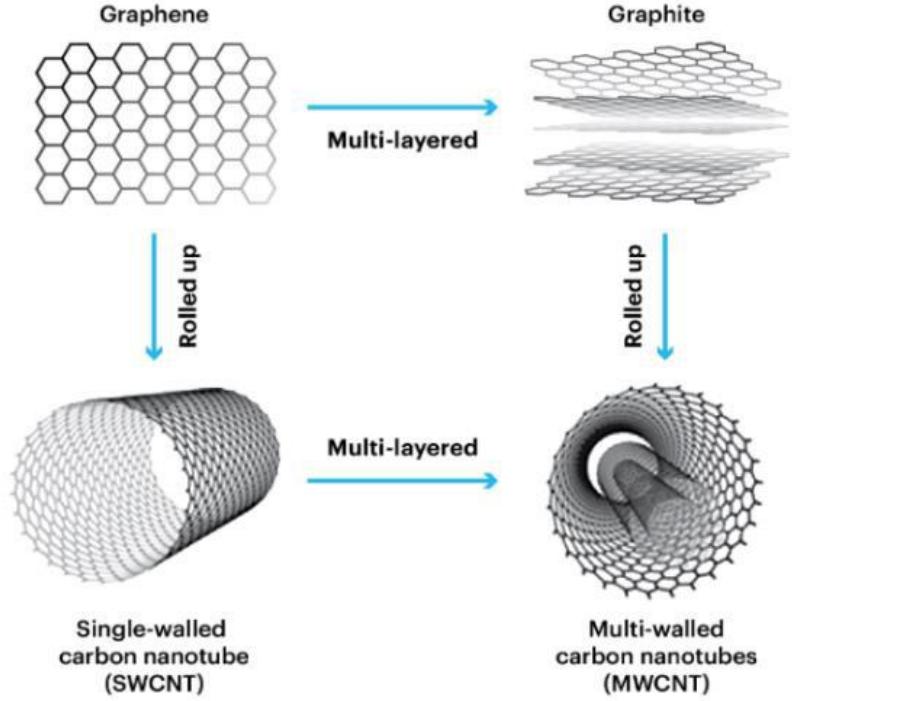
January 2025

About Matteriall



- Matteriall booth under the ESA BIC VILLAGE Pavilion at Industry Space Days at ESTEC – The Netherlands.
- Matteriall is headquartered in Innovation & Incubation Centre of KU Leuven and have a pilot laboratory in Verhaert – Kruibeke .

Overview of Carbon Nanotubes (CNTs)



- 50 times better strength comparing to 600 HWB armour steels (80 GPa)
- 1000 times better current-carrying capacity comparing to copper (4×10^9 A/cm²)
- Better thermal conductivity comparing to diamond (3500 W·m⁻¹·K⁻¹)
- Radar Absorbing Material - RAM (%90)
- Optical Transparency
- Lightweight, one sixth of density comparing to steel (1,3 g/cm³)

!THEORETICAL CHARACTERISTICS FOR INDIVIDUAL CNTs IN NANOSCALE!

The Team



CHIEF EXECUTIVE OFFICER

Hakan Taner

Metallurgical and Materials Engineer

+15 years in CNT and Advanced Materials



CHIEF OPERATING OFFICER

Dr. Gabriele Mogni

Materials Scientist with M.Sc. At Cambridge Uni., Ph.D. at Oxford Uni., Post-doc at Sorbonne



CHIEF FINANCIAL OFFICER

Ilhan Karakas

+10 years of experience in financial roles at Big Four, Former Executive Director at EY



TECHNICAL CONSULTANT

Dr. Julien Amadou

+20 years in Nanomaterials, Former CTO at Nanocyl (Senior Consultant– Sirris)



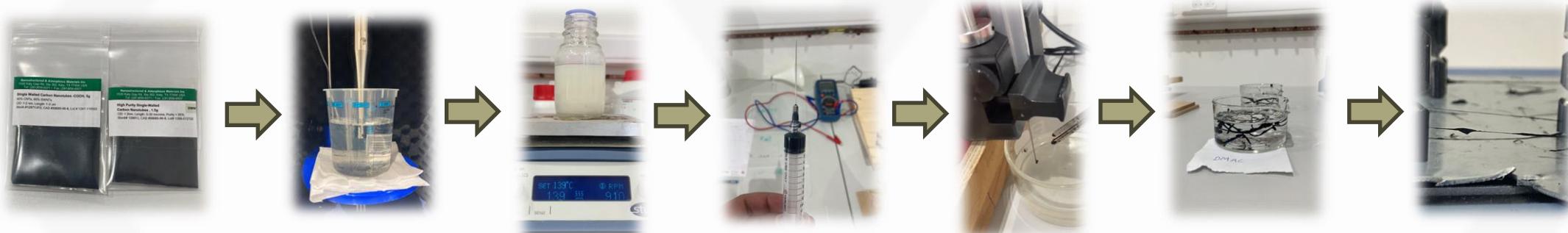
TECHNICAL CONSULTANT

Prof. Philippe Poulin

+20 years in Nanomaterials (Paul Pascal Research Centre - University of Bordeaux)

Matteriall team has the accurate content of knowledge, experience and skills to deliver especially on CNTs and their applications.

Current Pilot Process and Competencies



Functionalization
+ Purification of
RAW CNTs

Homogenous
Dispersion of
CNTs in
Liquid /
Polymer
Matrices

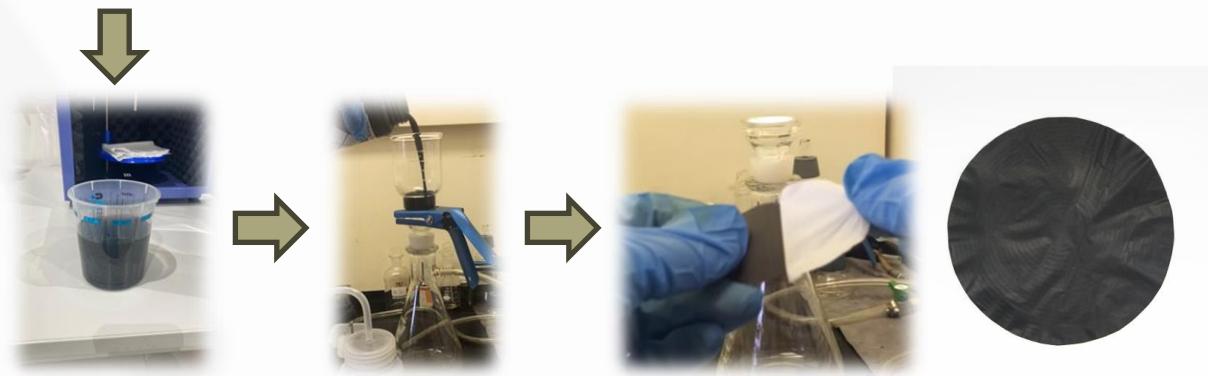
Polymer
Bath
Preparation

Dope
Preparation

Coagulation
of CNTs
dispersion
in polymer
bath

Washing +
Solidification
of CNT fibers
in water

Mechanical
Stretching
+ Drying



Coatings

Filtration +
Vacuum

Films / Tapes

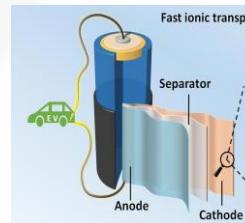
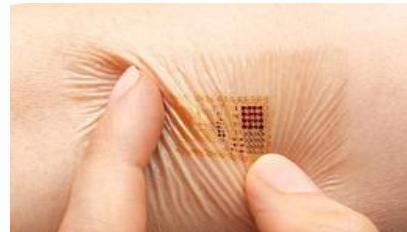
Scaled Up Process Schematic



CNT Production



Automated Fiber Production



Waste & Sustainable Carbon Sources

MVPs Being Developed

Matteriall's unique technology will be scaled up to deliver fibers, yarns and films that are made of essentially pure CNTs with superior properties.



**CNT DISPERSIONS
AND SOLUTIONS**



**CNT FIBERS AND
YARNS**



**CNT FILMS AND
SHEETS**

- ✓ Strong
- ✓ Conductive
- ✓ Lightweight
- ✓ Flexible
- ✓ Corrosion Resistant

By-products

MERCK Type in Product Names, Product Numbers, or CAS Numbers to see suggestions.

Applications ▾ Products ▾ Services ▾ Support ▾ Login / Sign Up | Quick Order |

Shopping Cart

Enter product SKU, complete with package size.

Enter Product SKU - 1 + Add

Items in your cart (1)

 791490-25ML Sigma-Aldrich Carbon nanotube, single-walled, conductive aqueous ink, SWCNT 0.2 mg/mL	€272.00	- 1 +	€272.00
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SUMMARY

Subtotal	€272.00
Transportation/Handling	€23.00
Tax	€61.95
Total	€356.95



CNT Dispersion as by-product:
With Matteriall Technology; production cost of around 50 Euros (5 mg of raw CNTs will be utilised by the Matteriall dispersion technique). Just below 200 Euros is foreseen as the sales price of Matteriall.

MERCK Type in Product Names, Product Numbers, or CAS Numbers to see suggestions.

Applications ▾ Products ▾ Services ▾ Support ▾ Login / Sign Up | Quick Order |

Shopping Cart

Enter product SKU, complete with package size.

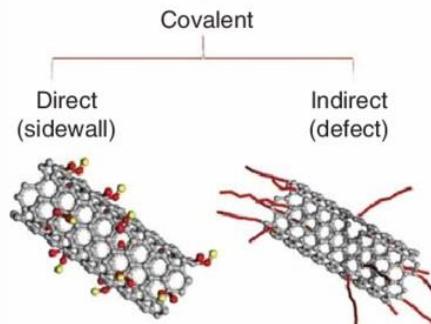
Enter Product SKU - 1 + Add

Items in your cart (1)

 652490-250MG Sigma-Aldrich Carbon nanotube, single-walled, carboxylic acid functionalized	€725.00	- 1 +	€725.00
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SUMMARY

Subtotal	€725.00
Transportation/Handling	€23.00
Tax	€152.25
Total	€877.25

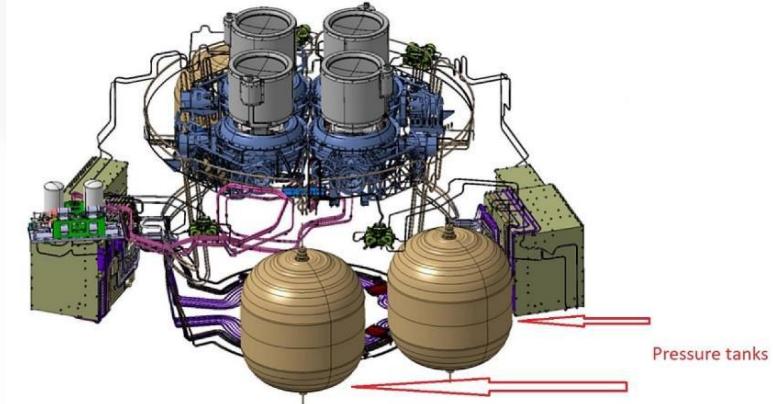


Functionalized CNTs as by-product:

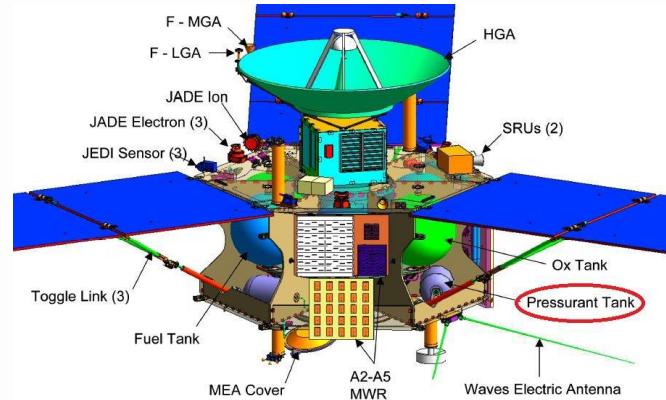
Production cost of around 200 Euros (250 mg of raw CNTs and around 1L of carboxylic acid will be utilised by the Matteriall functionalization technique). Around 600 Euros is foreseen as the Matteriall Sales price

Potential Applications (Composite Overwrap Pressure Vessels)

Conventionally, typical carbon fiber materials are used as the wrapping material on the Composite Overwrap Pressure Vessels. There's potential for the structural properties of CNTs to be much stronger than carbon fiber composites



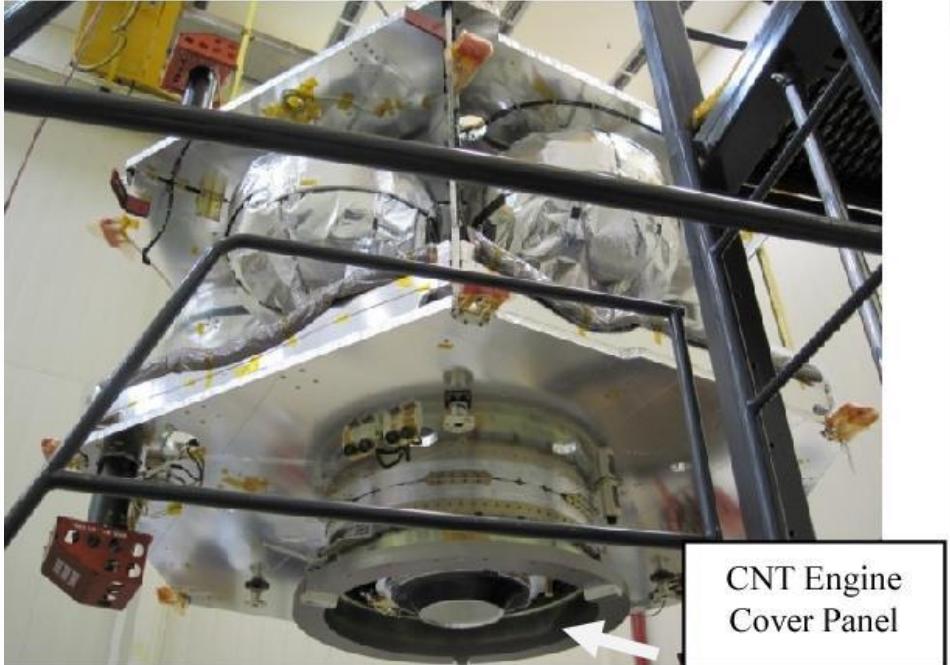
Thruster set-up of BepiColombo's Mercury Transfer Module (MTM) (Credit:ESA)



NASA's Juno spacecraft which had been launched for the Jupiter mission (nasa.gov)

- ✓ Hydrogen gas storage tanks
- ✓ Other bulk natural gas storage tanks
- ✓ All the metallic/composite structures that are pressurized for gases

Potential Applications (Replacement of Metals for Protection against Electrostatic Discharges)

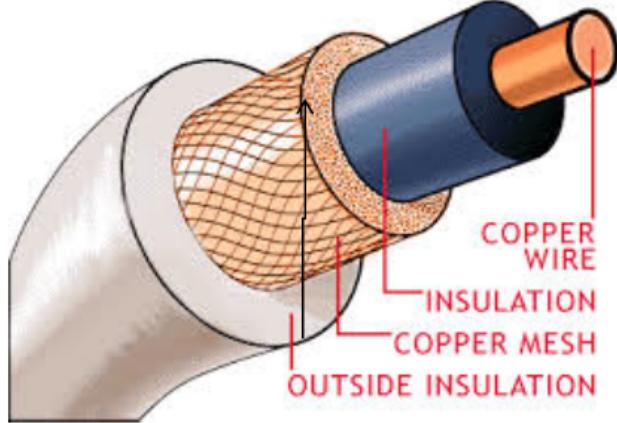


Juno's main engine, its cover is closed, visible on the spacecraft's underside (NASA)

- ✓ Lighter ESD protection solutions in flight protection systems
- ✓ Matteriall films can be incorporated as a layer directly on the composite
- ✓ More integral part of the spacecraft's (direct bonding, better adhesion)
- ✓ Flexible and foldable (applicable for more complex shaped parts)

Potential Applications (Ultralightweight CNT Wires for Space/Aerospace)

Replacement of copper-based 1553 database cables (MIL-STD-1553, or, STANAG 7221)

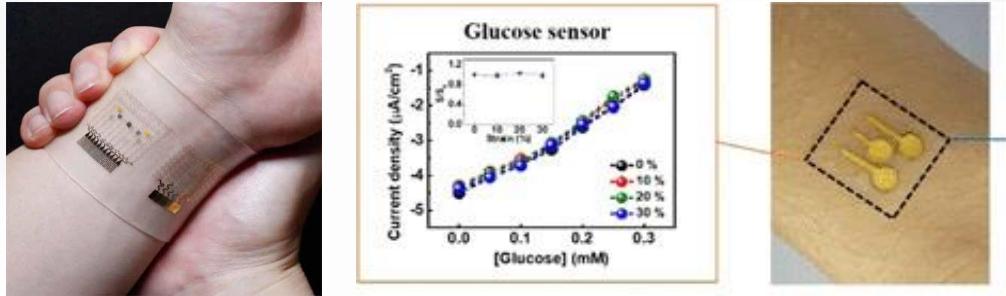


- ✓ 100 microns thick compared to 500 micron thick Cu based cables
- ✓ Comparable cable attenuation (power loss) and mechanical durability with approximately over 95 % lower component mass
- ✓ More than 25% flexural tolerance

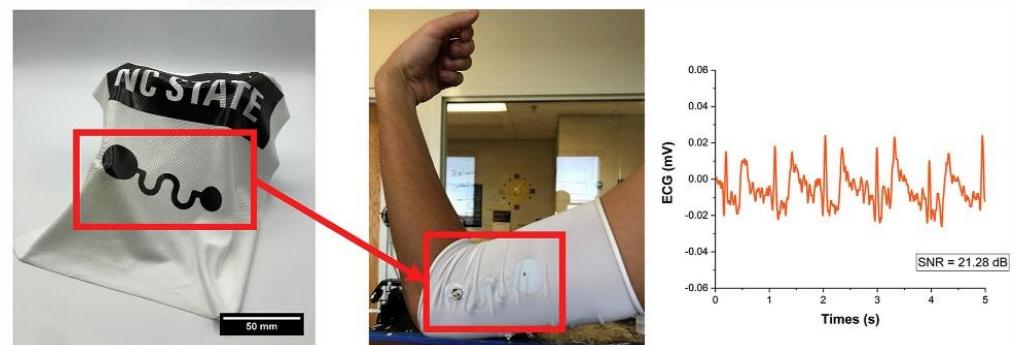


For a single-aisle aircraft, a 1% reduction in weight can lead to a net cost savings up to 1.3M€ per year during the usage. For larger aircrafts, the savings can reach up to 5M€ per year (an Airbus A380 has more than 500km length of wiring, weighing around 4.2 tonnes, and half of this weight comes from the wiring shielding components).

Potential Applications (Remote Health Monitoring)

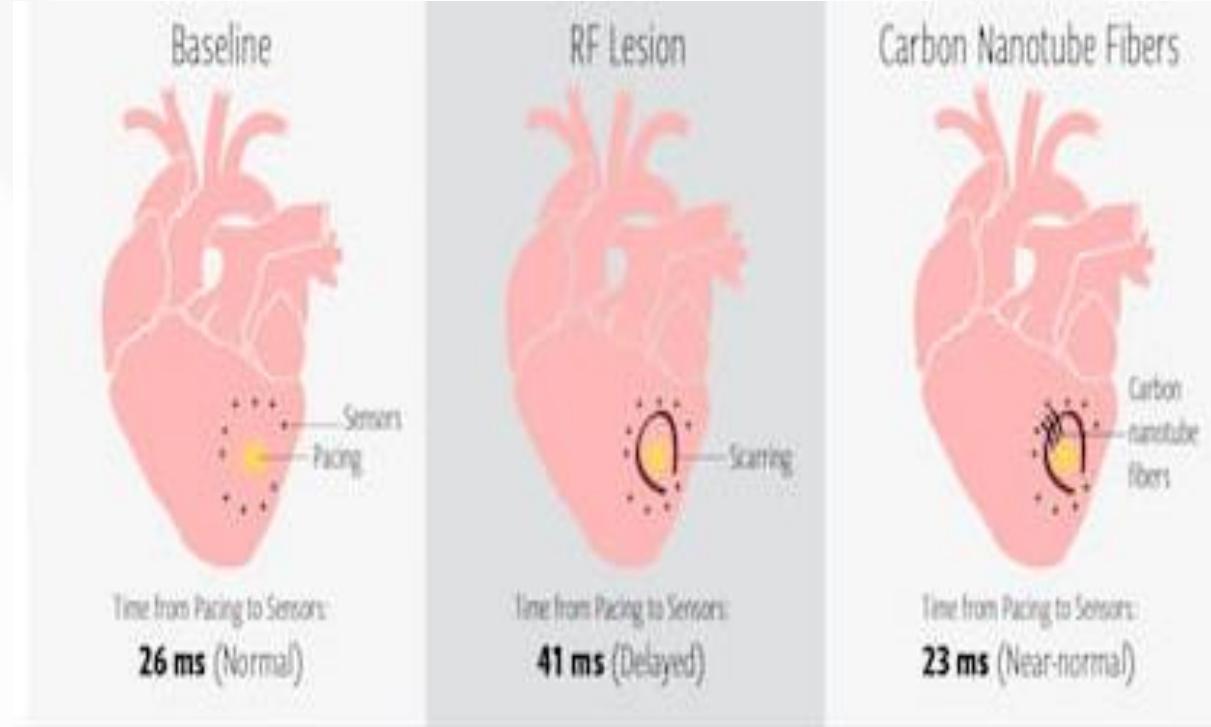


- Skin-Attachable, Stretchable Electrochemical Sweat Sensor for Glucose and pH Detection (Sweat-based glucose-monitoring and feedback transdermal drug-delivery system)



- Carbon nanotube (CNT) thin films for biosensing e-textile applications (dry contact with the skin to monitor the movement and muscle contraction)

Potential Applications (Remote Health Monitoring)



Thin, flexible fibers made of carbon nanotubes are recently proven to be able to bridge damaged heart tissues and deliver the electrical signals.

Carbon nanotube fibers have the conductive properties of metal but are flexible enough to navigate and deliver energy.

Sales Channels



BY-PRODUCTS
(CNT Solutions and Functionalized CNTs)



FINAL PRODUCTS
(CNT Fibers and CNT Yarns)

- Rapid Online Sales via www.matteriall.com.
- Existing network in universities, institutions, R&D departments of companies.
- Customized CNT dispersions and functionalized CNTs according to the customer needs.
- Distributorships to be granted worldwide.

- Joint Project Development Partners (ESA Subcontractors, Aerospace / Space Companies, Composite Manufacturers, Automotive Manufacturers, e-Textile and sports equipment manufacturers)
- Customized characteristics (required electrical conductivity and/or mechanical strength)
- Existing worldwide network in the industry.
- Distributorships to be granted worldwide

Existing Credentials of Matteriall



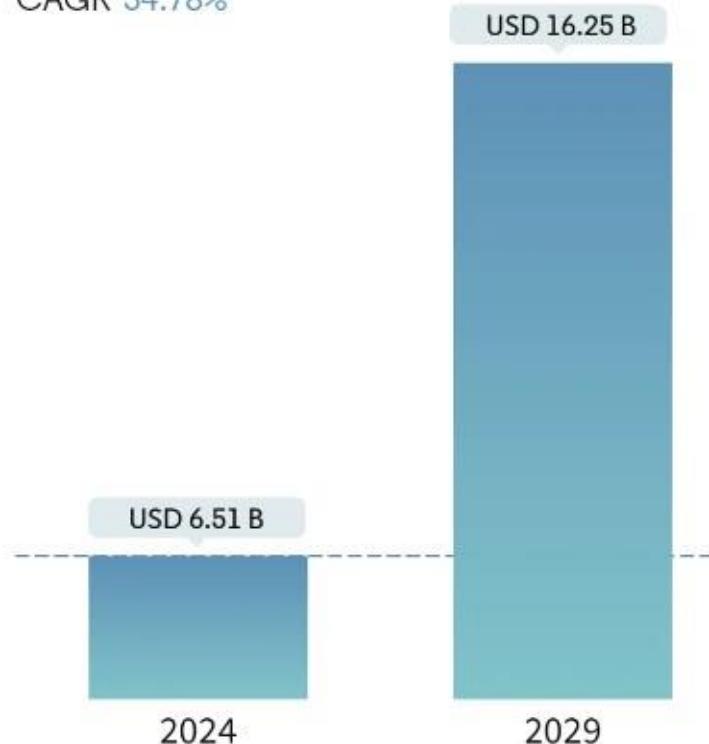
- ✓ Founder's hands-on experience/know-how on CNTs and their applications.
- ✓ ESA network and business support.
- ✓ Existing local and worldwide network of potential customers and researchers in the relevant field and.
- ✓ Close follow-up and familiarity with the most recent studies.

Market Analysis

Carbon Nanotubes Market

Market Size in USD Billion

CAGR 34.78%



Study Period	2019 - 2029
Market Size (2024)	USD 6.51 Billion
Market Size (2029)	USD 16.25 Billion
CAGR (2024 - 2029)	34.78 %
Fastest Growing Market	Asia-Pacific
Largest Market	Asia-Pacific

- ✓ The overall CNT market is expected to continue rising, ending up at a total of **USD 16.25 Billion by 2029.**
- ✓ **CAGR 34.78%**

The timing of Matteriall Project

**Why is it
the right
time for a
material
revolution
?**

- ✓ Carbon fibers, the state-of-art materials, have reached their ultimate properties.
- ✓ Combination of conductivity, lightweight and mechanical properties is needed in a single material.
- ✓ Rising concern for the electromagnetic interference (EMI) of the electrical and electronic components in every industrial application.
- ✓ The mechanical, electrical and thermal conductivity properties of individual CNTs are widely validated by a great number of researchers.

Experience in CNT commercialization

Nanocyl S.A.
rue de l'Essor, 4
5060 SAMBREVILLE
BELGIUM



THE CARBON NANOTUBE SPECIALIST

www.nanocyl.com
Tel +32 71 750 380
Fax +32 71 750 390
info@nanocyl.com

NANO TEKNOLOJİ BİLİŞİM İMALAT VE DANIŞMANLIK LTD. ŞTİ.
("Nanografi")
ODTÜ Kosgeb Tekmer Binası No: 308 ODTÜ
Teknokent 06531- ANKARA
Turkey

Sambreville, May 29, 2012

Dear Madam, Dear Sir,

This Letter of Intent is a summary of the principal terms with respect to a possible and future collaboration between the parties for the distribution of the Products. Such summary of terms is intended as a basis for further discussions but will not give rise to legal rights or obligations (except for the Confidentiality Clause).

Choice of agreement: The mutual intention of the parties is, after an 18 months period of test, to decide if they want to enter into a distributorship's agreement governed by the laws of Belgium, whereby the Distributor agrees to resell in its own name and for its own account, in the Territory, the Products supplied by the Supplier.

Supplier: NANOCYL SA

Distributor: NANOGRAFI

Territory: Turkey

Products to be distributed: NC7000™, Plasticyl™, Epocyl™ and Aquacyl™

Terms of payment: Supplier's current list prices, subject to Supplier's Terms and Conditions of Sales, in their current container sizes. DISTRIBUTOR will be free to resell them at a valuable price, which provides, at DISTRIBUTOR's discretion, the adequate coverage of DISTRIBUTOR's operational costs and a reasonable profit margin.

Non-exclusivity: The Supplier may grant any other person or undertakings within the territory the right to represent or market the products. The Supplier may furthermore sell to customers established in the Territory.

Confidentiality: Each Party undertakes to treat as strictly confidential and not to divulge to any third party any of the information marked "Confidential" disclosed by the other Party and not to make use of any such information without the other Party prior written consent.

Page 1 of 2

Legal effect:

This LOI is not legally binding for the parties EXCEPT FOR THE CONFIDENTIALITY OBLIGATION and shall be governed by and construed in accordance with the laws of Belgium.

Each company will be responsible for its own costs and expenses incurred prior to and during the execution of any definitive legal agreements, if any, and understand that this Letter of Intent is not intended to induce reliance on the part of either party.

For the avoidance of doubt, any document received prior to and during the period of test will not constitute an agreement, except if approved by legal department of Nanocyl and signed by an authorized representative of both parties.


Francis Massin
Managing director
Nanocyl S.A.


Hakan TANER
Managing Director
NANOGRAFI

Page 2 of 2

Experience in CNT commercialization

Intelligent Materials Pvt. Ltd.



MUTUAL SALES AGREEMENT

Agreement between Nanoshel LLC Wilmington, USA (Company) and **Nanografi Nano Teknoloji Bilişim İmalat ve Danışmanlık Ltd. Şti.** Kosgeb Tekmer Binası No: 308 ODTÜ , Teknokent 06531- ANKARA (Distributor).

Nanografi Nano Teknoloji Bilişim İmalat ve Danışmanlık Ltd. Şti. agrees to:

1. Represent and sell the Company's products / services, specifically described as
 1. Single Walled Carbon Nanotubes (SWCNT's)
 2. Multi Walled Carbon Nanotubes (MWCNT's)
 3. Functionalized Multi Walled Carbon Nanotubes (MWCNT's)
 4. Functionalized Single Walled Carbon Nanotubes (MWCNT's)
 5. Metal Nanoparticles
 6. Oxide Nanoparticles
 7. Compound Nanoparticles
 8. Wafers & Sputtering Targets
9. Safety Equipments and all other products listed on the website in the geographical area of **Turkey**
2. Accurately represent and state, Companies policies to all potential and present customers.
3. Promptly mail in all orders to the Company.
4. Inform the sales department of all problems concerning Company customers within that sales territory.
5. In no event shall **Nanografi Nano Teknoloji Bilişim İmalat ve Danışmanlık Ltd. Şti.** represent a competitive company or product line either within or outside the designated sales area.
6. 100% Advance Payment by Telegraphic Transfer in favour of Intelligent Materials Pvt Ltd, Via Swift Code.
7. Maintain contact with the NANOSHEL via telephone, e-mail, or other agreed upon means of communication with reasonable frequency to discuss sales activity within the territory.
8. Provide NANOSHEL 30-days' notice should the Representative intend to terminate this agreement.

Intelligent Materials Pvt. Ltd.



9. **Nanografi Nano Teknoloji Bilişim İmalat ve Danışmanlık Ltd. Şti.** Agrees to take exclusive Rights for **1 Year** after which contract will be revised.
Nanoshel LLC agrees to:

1. Pricing to the Nanografi Nano Teknoloji Bilişim İmalat ve Danışmanlık Ltd. Şti.:
 - (a) Prices given to the Nanografi Nano Teknoloji Bilişim İmalat ve Danışmanlık Ltd. Şti.. will be Net Prices.
 - (b) No Discounts are offered by the company.
2. Set minimum monthly quotas after consultation with the **Nanografi Nano Teknoloji Bilişim İmalat ve Danışmanlık Ltd. Şti.**
3. Grant **Nanografi Nano Teknoloji Bilişim İmalat ve Danışmanlık Ltd. Şti.** 30-days notice should the Company wish to terminate this agreement.
4. The liability of NANOSHEL shall be limited to the sales price; no other warranty is expressed or implied.
5. Prices in NANOSHEL Price Lists are in (USD). Payment of applicable customs fees, taxes, etc. is the Customer's responsibility.
6. Company agrees to exclusive rights for **1 Year** after which contract will be revised.
7. All inquiries generated by company from **United Turkey** will be diverted to the distributor for the agreed period.

This agreement shall be binding upon the parties and their successors and assigns.

Signed this 13th day of March 2013.

The Agreement Commences from 1st April, 2013

COMPANY:	AGENCY:
Nanoshel LLC Wilmington United States	Nanografi Nano Teknoloji Bilişim İmalat ve Danışmanlık Ltd. Şti. ODTÜ Kosgeb Tekmer Binası No: 308 ODTÜ Teknokent 06531- ANKARA
Abhishek	Hakan TANER

Signature /Stamp



Signature /Stamp



Thank you for your attention!



Hakan Taner

E-mail : hakan.taner@matteriall.com

Phone : +32489517602