CANATU

Transforming products for better tomorrows with nano carbon

Canatu is a carbon nanomaterial developer. We create the most advanced carbon nanotubes for industry-transforming products.

Background

- Aalto University spin-off
- HQ, R&D and production in Finland
- 90+ international team with 20 nationalities

Technology

- Over 150 patents across 25 patent families
- Award-winning technology
- ISO 9001, ISO 14001, IATF 16949

Carbon nanotubes are the building block of the future. Canatu CNT is highly developed and offers consistent quality, reliability and performance for highly engineered solutions.

Our expertise in nanotechnology and working with carbon makes us versatile. We enable breakthrough innovations and solutions that have a wide-reaching impact in select industries.

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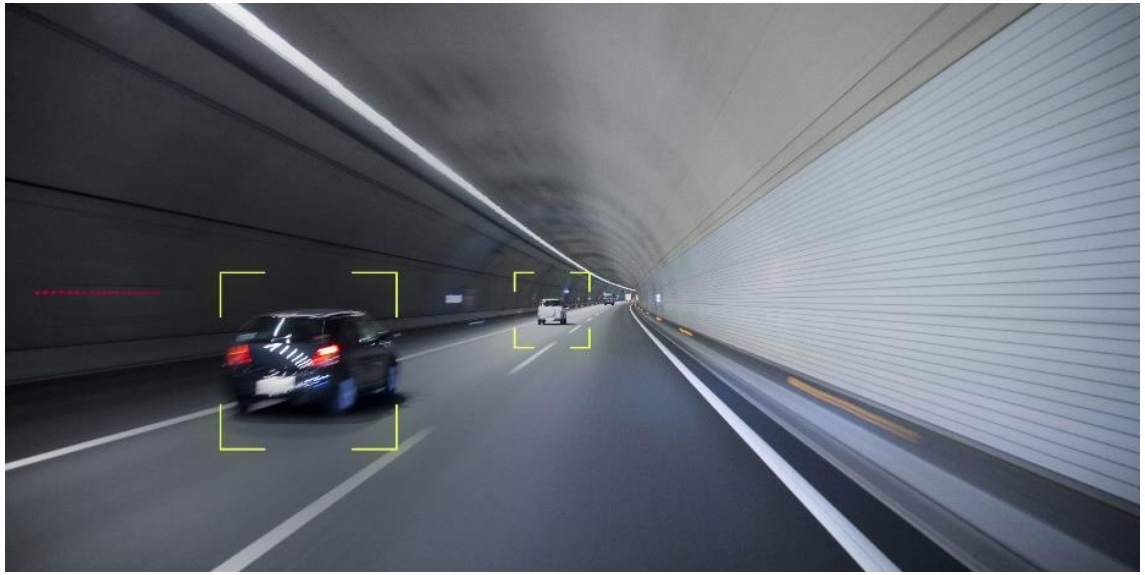
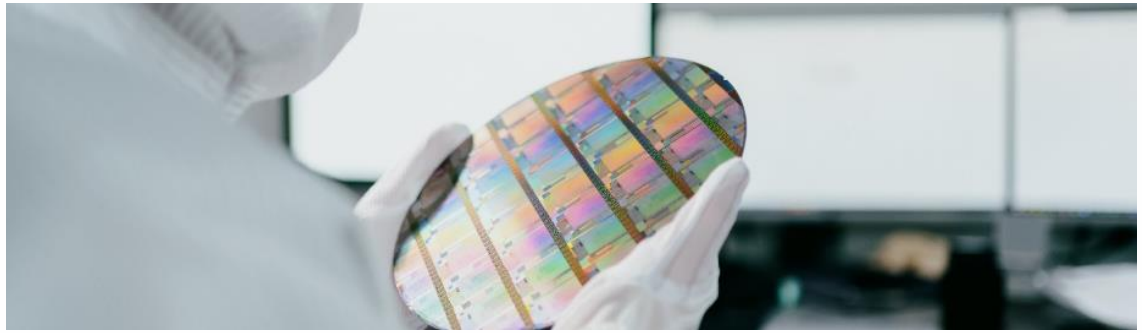
Collaborating with some of the world's most exciting companies to enable industry breakthroughs





Commercial development

- Mass production for three automotive OEMs
- Almost 1,000,000 sensors delivered
- EUV membrane mass production in 2021
- Multiple SOPs in 2023

Shareholders

DENSO

3M

faurecia

MINTH

inventure

eFruit International Inc.

ASCEND CAPITAL PARTNERS

Mymetics

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Mass production since 2015

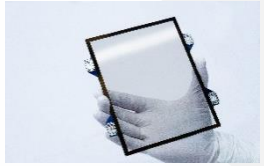
FFR 0

- ISO6 clean room production
- Fully automated roll to roll line (600mm wide)
- Semiconductor semi-automated manufacturing line
- Fast prototyping
- Sensor manufacturing outsourced to Asia

We enable breakthroughs with forerunners

Canatu is the global leader in advanced CNT. Our customers are some of the most exciting companies in the world.

EUV membrane
Semiconductor - high yield masks for <7nm chips



EUV pellicle
Semiconductor - high productivity <7nm chips

ADAS heaters
Autonomous driving in any weather

3D touch
Digitalization – any surface can be smart

3D Smart Window interconnect

Electrochemical sensors
Laboratory level sensing anywhere in seconds

Key benefits	The lead EUV membrane vendor: nanoscale, transparency, heat resist	Highest EUV transparency for EUV NA	Even heating and low haze for ADAS heaters	The lead transparent 3D capacitive touch sensor	Stretchable transparent smart window interconnect	Sensitive, selective and fast voltametric substance sensing

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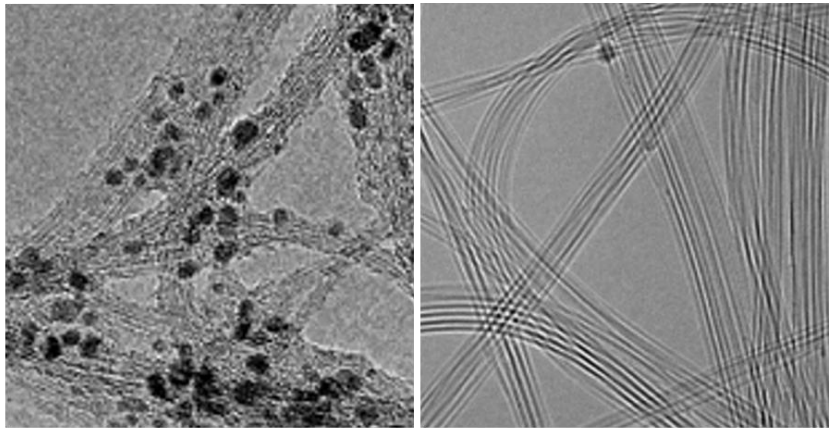
Canatu’s patented and unique process ensure consistent quality for highly engineered solutions

- Floating Catalyst Chemical Vapor Deposition (FC-CVD) process providing enhanced control of CNT growth with low variation
- Dry deposition resulting in longer and cleaner carbon nanotubes
- Leading control of structures and properties
- Record-high CNT transmittance and conductivity



Wet dispersion Dry deposition

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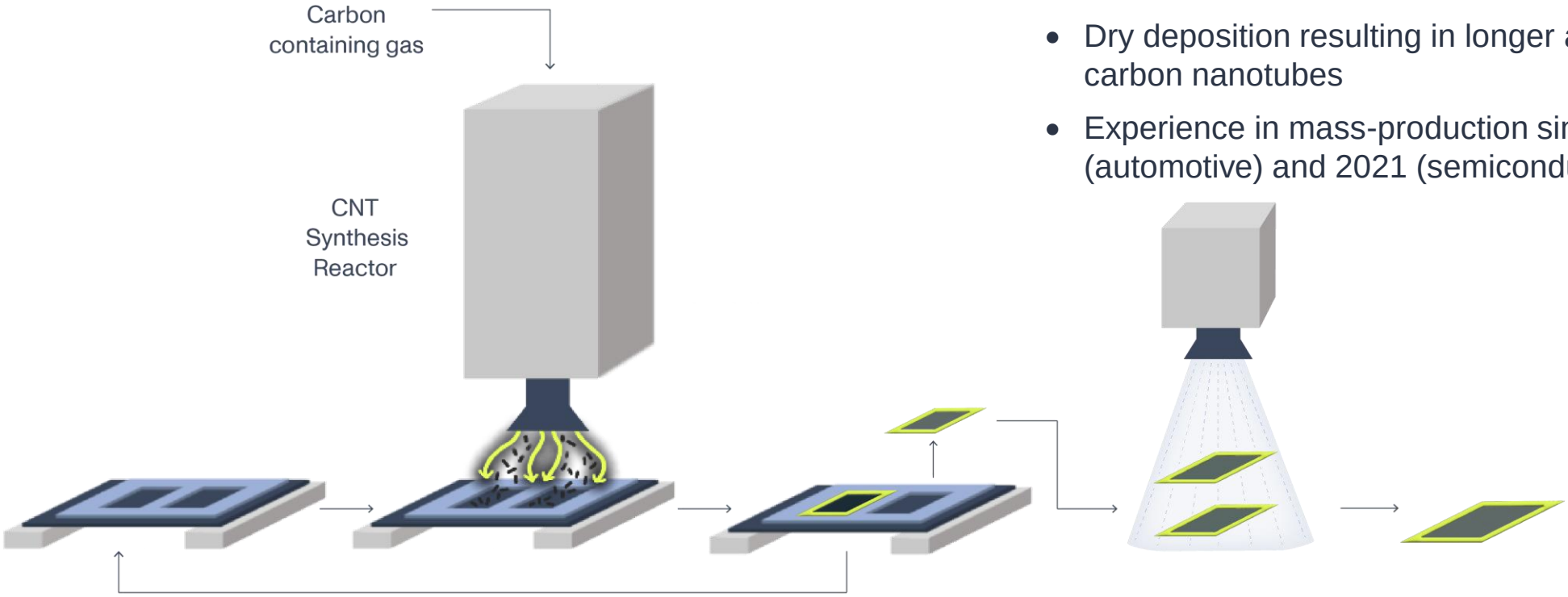
Canatu’s unique process ensure consistent quality of the most advanced carbon nanotubes for highly engineered solutions

- Floating Catalyst Chemical Vapor Deposition (FC-CVD) process providing enhanced control of CNT growth
- Dry deposition resulting in longer and cleaner carbon nanotubes
- Experience in mass-production since 2015 (automotive) and 2021 (semiconductor)



Step 1:
Collection filter is prepared.

Step 2:
Dry deposition of CNTs onto collection filter.

Step 3:
Deposited CNTs are transferred from collection filter to a frame.

Step 4:
Post-treatments to modify or enhance properties, such as to increase adhesion of CNTs to frame material.

Step 5:
Free-standing CNT membrane is inspected and tested.

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Canatu products

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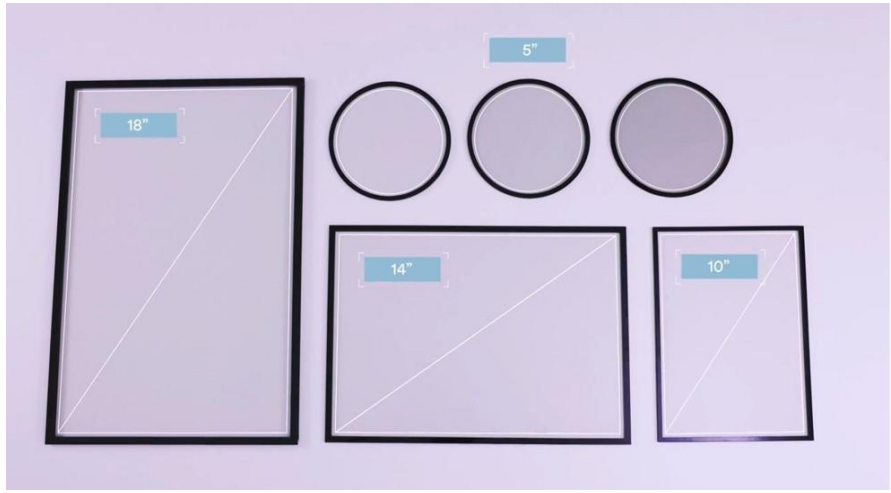
Enabling the next step in semiconductor efficiency with EUV membranes

- Ultra-thin EUV filters with high transmittance (97%T at EUV) and high heat resistivity (1500C)
- Customizable synthesis and post-processing enabling enhanced properties
- Various sizes, shapes and thicknesses; different frame materials
- EUV pellicles, debris filters and optical filters



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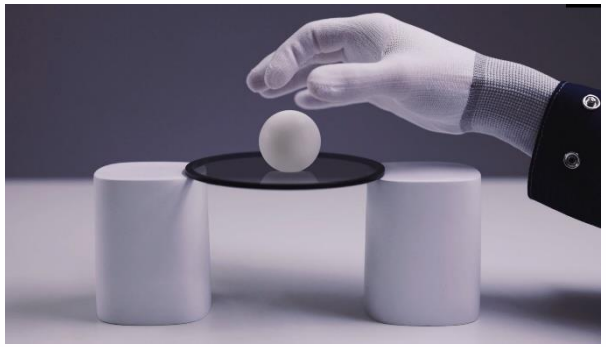
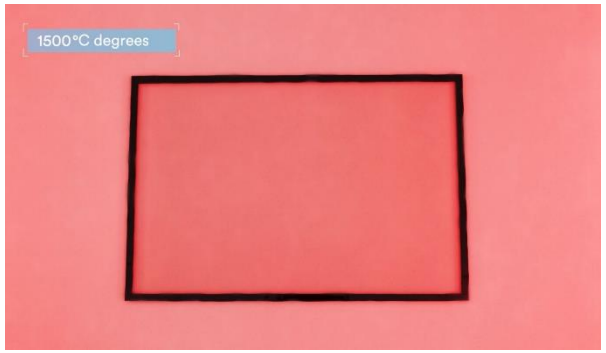
Truly remarkable properties unequalled by any other material



MECHANICAL ROBUSTNESS

- High tensile strength
- Ultra flexible
- Gas filtration



HIGH HEAT RESISTIVITY AND ELECTRICAL CONDUCTIVITY

- Super high thermal stability / heat resistivity >1500°C
- Remarkable electrical conductivity

HIGH TRANSPARENCY

- More than 97% transmission of light at EUV / X-Ray
- Low flare (scatter)
- Low EUV reflectivity

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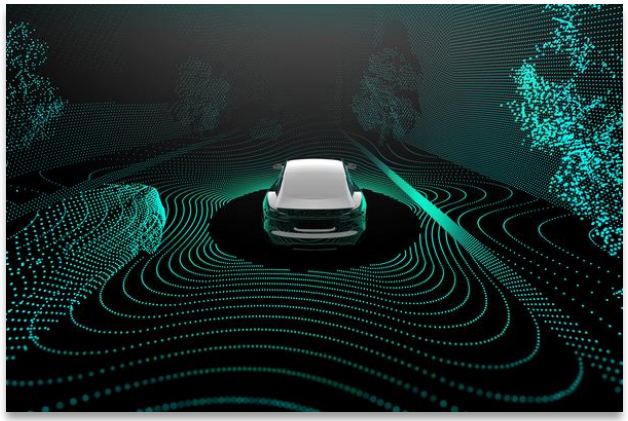
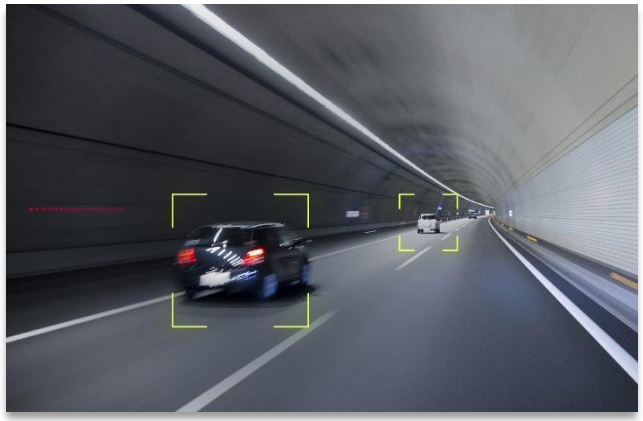
Moving towards full driver autonomy with Canatu CNT film heaters



Canatu ADAS LiDAR heaters

Canatu CNT film heaters provide clear field of view for the laser beam ensuring accurate LiDAR mapping of the surroundings.



Canatu ADAS camera heaters

Wire-free Canatu CNT thin film heaters provide even and power-efficient heating throughout the whole surface enabling accurate object detection in any weather.

Canatu headlamp heaters

High-performance Canatu CNT film heaters keep headlights clear for safe driving in adverse weather.

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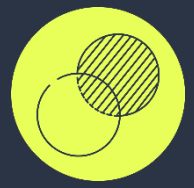
Canatu film heater features and benefits

Key benefits	Unique features
 Superior optical performance	• High transmittance in IR and visible wavelengths • Wire-free, low reflection and haze • High wavefront uniformity
 Even and power-efficient heating	• High electrical conductivity • Even heating without optics-degrading thermal gradient • Lower power consumption compared to wire heaters
 Design and integration flexibility	• Customizable to customer needs • Can be implemented on various flexible film substrates • 3D formable with < 1mm bending radius, stretchable up to 200% • Multiple integration options including FIM, in/on-glass lamination

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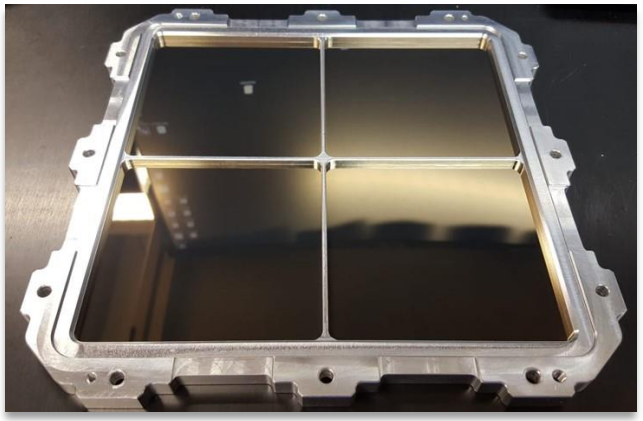
Expanding application space for future technologies



Optical filters

Enabling accurate X-Ray imaging of the celestial objects, owing to the high X-Ray transparency, mechanical robustness, and chemical inertness of Canatu CNTs.

Developed for the future space telescope ATHENA under the European Space Agency (ESA) program.

Electrochemical sensors

Highly repeatable electrochemical transducer platform for various analyses. Portable, affordable and easy to use method for measuring painkiller concentrations in close to real-time at POC.

Validated in early clinical studies.

Smart Window interconnects

Smart Windows with free form-factor for next-generation vehicle, enabled by the unique mechanical properties of Canatu CNTs, such as stretchability (>100%) and formability (<1mm radius).

In Development.

CANATU

Making immediate diagnostics possible

Electrochemical sensors

- Electrochemical test strips for point-of-care diagnostics
- Portable, affordable and easy to use method for measuring painkiller concentrations in real-time
- Validated in early clinical studies (acetaminophen)
- Test strips for measuring opioid concentrations in blood enabling timely clinical decisions on-the-spot
- Highly repeatable electrochemical transducer platform for various analyses

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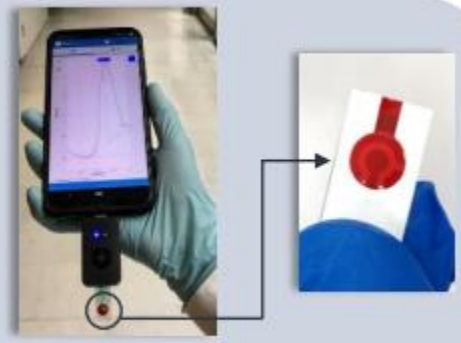
High surface area

High sensitivity and signal-to-noise ratio

Repeatable low-cost platform

Potential Applications



Medical Diagnostics

Examples:

- *Opioids*
- *Antibiotics*
- *Anti-cancer drugs*
- *Anticoagulants*
- *Bacteria*
- *Viruses*
- *Hormones*

Food & Agriculture

Examples:

- *Bird flu*
- *Antibiotics*
- *Salmonella*
- *Streptococcus*

Veterinary

Examples

- *Opioids and other anesthesia*
- *Diseases and infections*
- *Laboratory animals testing*

Environmental

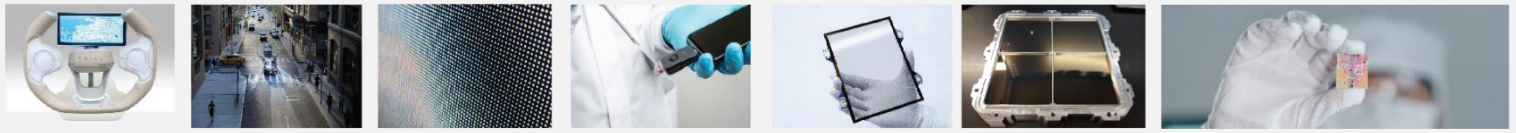
Examples:

- *Water testing for PFAS and heavy metals*
- *Bacteria*

Industrial

- *Examples:*
- *Process monitoring in fabs*
- *Mining*
- *Military*

Scalable platforms for creating transformative products with different industries



VALUE PROPOSITION	ANY SURFACE CAN BE SMART	AUTONOMOUS DRIVING IN ANY WEATHER	DISPLAYS WITH FREE FORM FACTOR	THE LAB ON A STRIP	EXTREMELY TRANSPARENT AND MECHANICALLY ROBUST EUV FILTER FOR NANOPARTICLES		CARBON ERA – CONTINUES MOORE'S LAW	
PRODUCT	TOUCH SENSORS IN 3D	ADAS HEATER	DISPLAY INTERCONNECT	ELECTRO-CHEMICAL SENSOR	EUV PELLICLE	EUV OTHER	RESISTIVE MEMORY MEMS	TRANSISTOR
PRODUCT PLATFORM	TRANSPARENT CONDUCTIVE FILMS			POINT-OF-CARE SENSING	FREE-STANDING CNT MEMBRANE			
MANUFACTURING PLATFORM	CNT FILM MANUFACTURING AND REACTORS				FREE-STANDING CNT MANUFACTURING AND REACTORS		CNT ON WAFER	SEMICONDUCTING CNT
COMMON CORE	CANATU CNT MATERIAL TECHNOLOGY AND IP							

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Compelling future application roadmap

Touch sensors in 3D
Mass production

Film heaters for ADAS
Licensed, mass development

EUV membranes
Mass production

EUV pellicles
Under development

Display interconnect
Pre-development

Electrochemical sensors
Clinical validation

Resistive memories and CNT transistors
Under study

“Our new vision is to create the most advanced carbon nanotubes for industry-transforming products”

Juha Kokkonen, CEO of Canatu

CANATU

Recognized and awarded for innovation and design

2004 — Canatu Oy founded

2007

2015 — First automotive customer SOP

2018 — Licensing deal with DENSO

2019 — New factory In Finland

2020 — Canatu CNT world record in optoelectronics

2021 — First semiconductor EUV pellicle SOP

2022 — Multiple SOPs for leading automotive OEMs

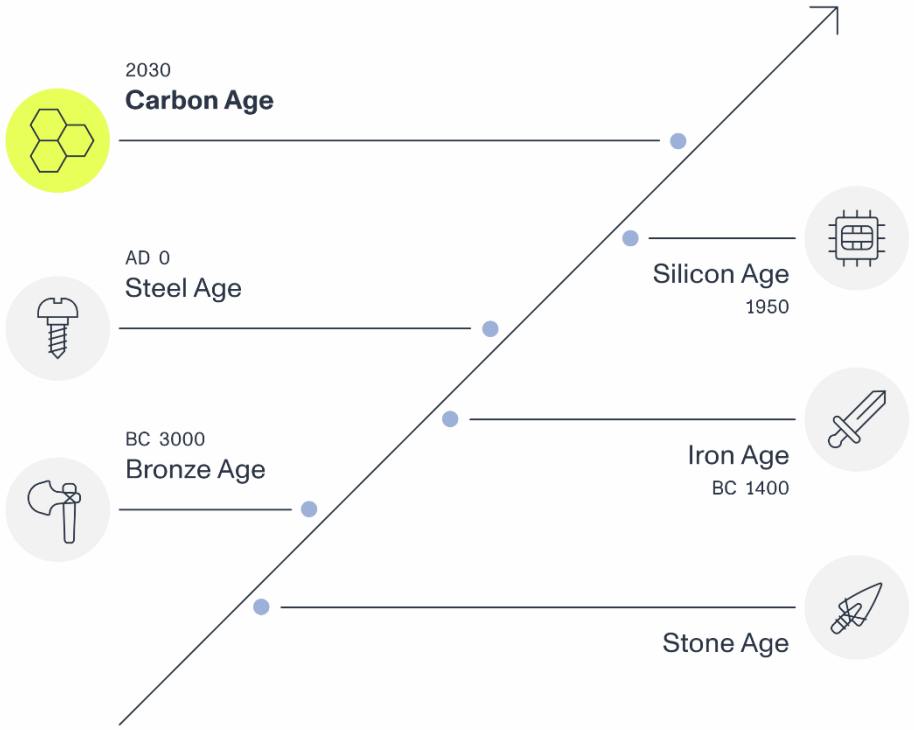
IATF 16949

CANATU

REVENUE $2MIL $6MIL $10MIL

Finally

The carbon age is coming and we accelerate its arrival by innovating with nano carbon



- New materials have ushered in the next eras of development and progress through history.
- We are entering a new era.
- Carbon will provide the foundation for continuing the growth of computing power according to Moore's law.
- We at Canatu work with nano carbon and create carbon nanotubes, which offer new possibilities for next generation solutions.
- The carbon age is coming – and we are proud to be a part of accelerating its arrival

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