MATERIALS WEEK EUROPE

The next speaker is...

Ekaterina Gorbunova
Vice President of Product Development for Elastomers
OCSiAl Group

OCSiAl
graphene nanotubes for the global industry

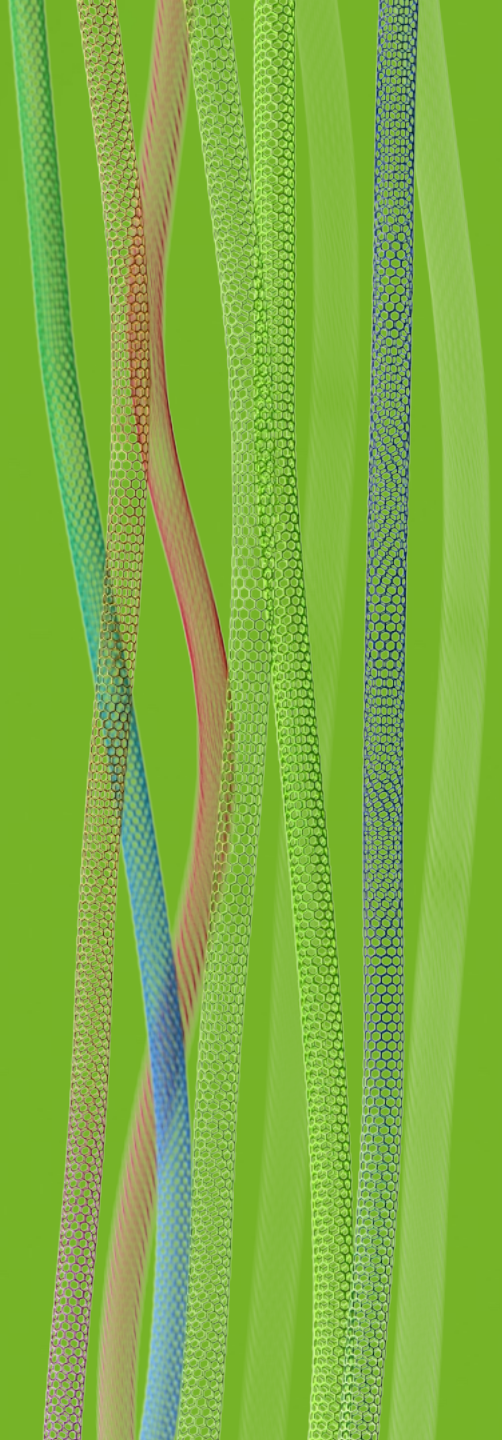
The Unbreakable Connection: Enhancing Circularity of Conductive Silicone with Graphene Nanotubes in Extreme Environments

Scan below for Conference Agenda

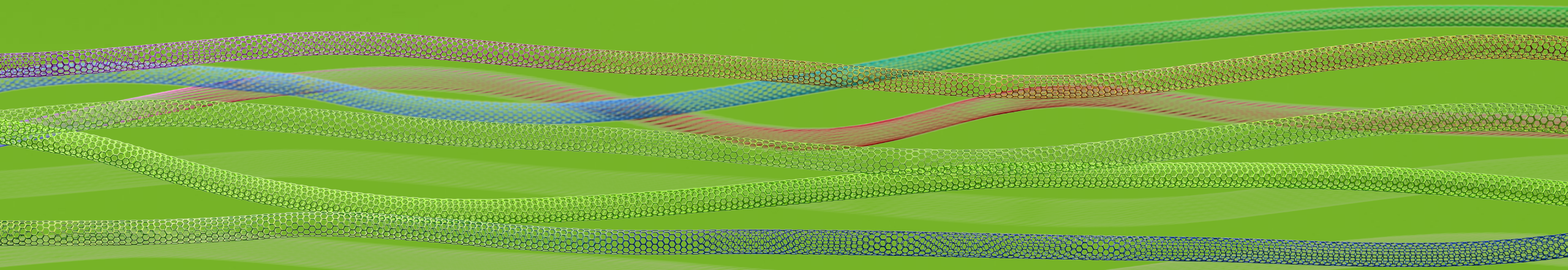
The unbreakable connection:

enhancing circularity of conductive silicone with graphene nanotubes in extreme environments

Ekaterina Gorbunova
25 February 2026, Silicone Expo, Amsterdam



Why a new generation of ESD protective materials is needed?



Industries vs requirements

Cable industry & Automotive

Electronics

Printing industry

Industries challenges – electrical connectors

Higher current ampacity

Higher operating temperatures for cable accessories

Zero-maintenance longevity

Revised SAE standard (AS81582D : 2025) now specifies that certain electrical connectors must be rated for operation up to **200°C** .
Draft European Norm **FprEN 50483-5:2025** include more stringent electrical ageing tests to ensure connectors can withstand long-term stress

TU Dresden presented at the 2025 IEEE Holm Conference, are investigating how factors like mechanical tensile loads can interact with thermal stress to shorten a connector's service life, especially as power grids are utilized more intensely

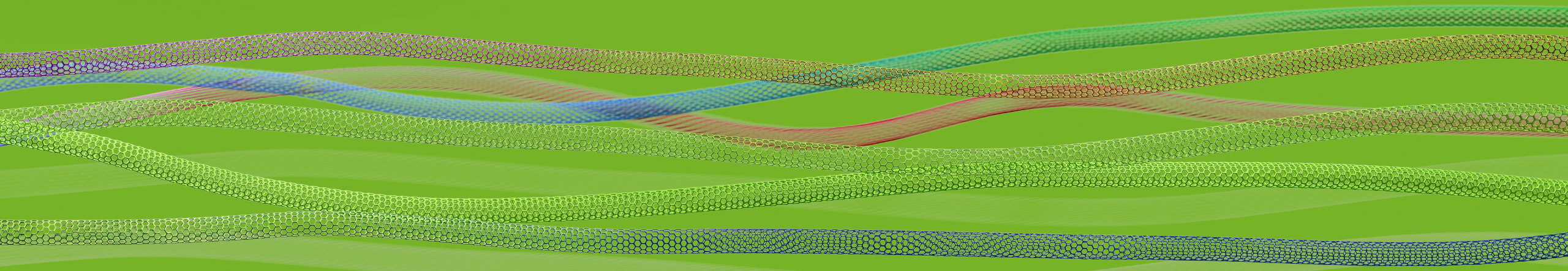
This tents manufacturers build connectors that are more resilient to these combined challenges

Industries challenges – electronics and diagnostics

- Bio-compatible flexible material for stable signal transfers
- Excellent elasticity and strength
- Longer mechanical service life

This tents manufacturers to develop new formulations and designs

New material requirements & extra functions



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Extra function examples

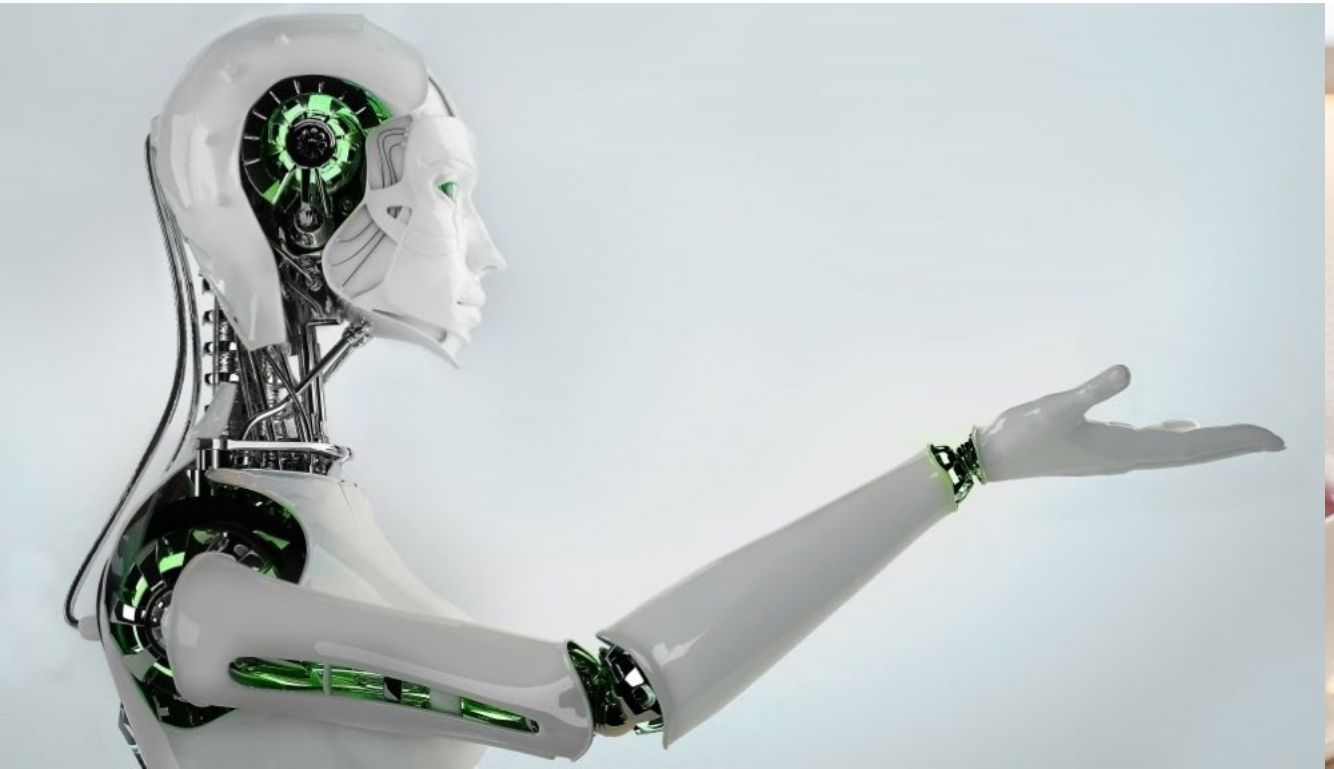
Touchscreen compatibility

Extra function examples

Electrical impulse stimulation in healthcare and diagnostics equipment

New material requirements

Robotic joints must withstand from
few thousands to 1,000,000+ cycles

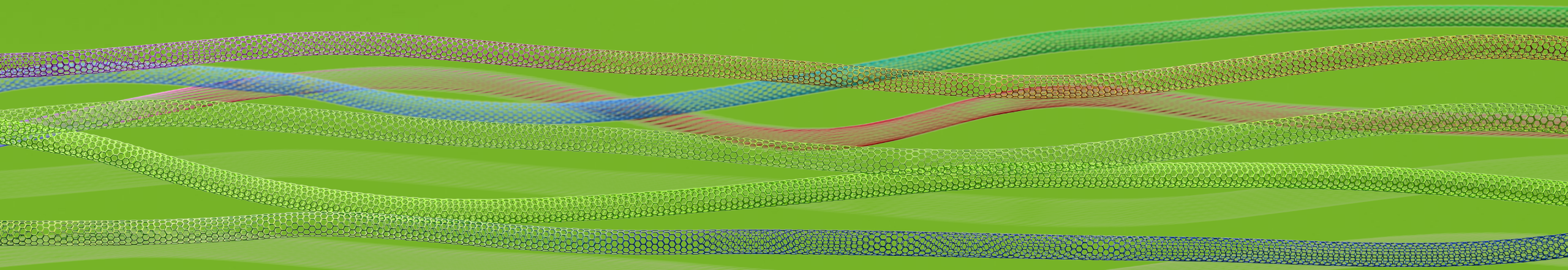


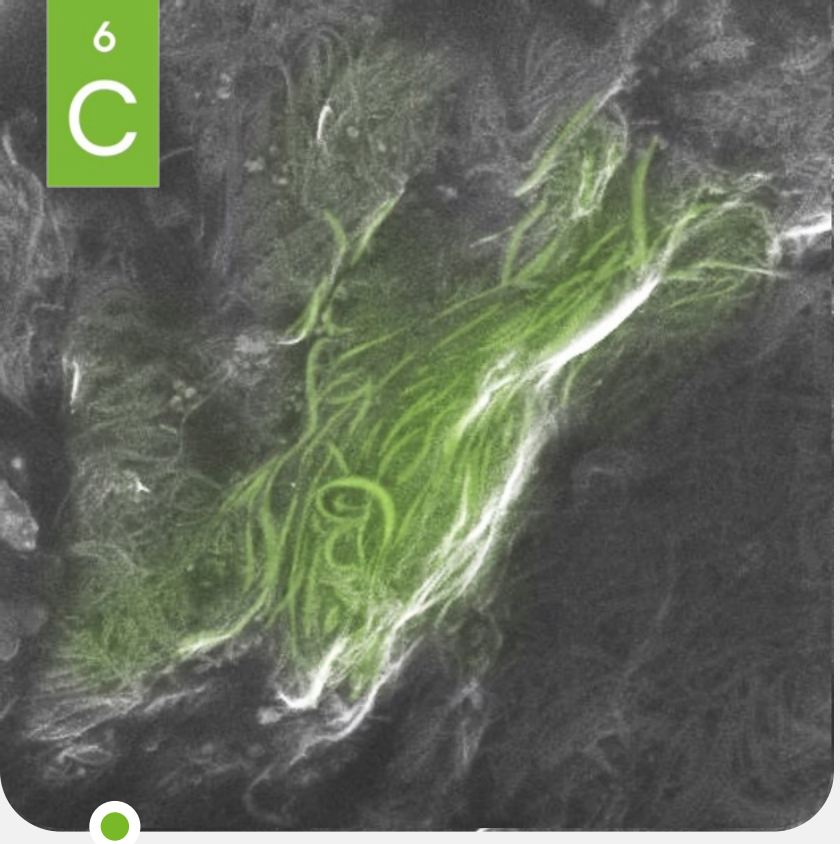
New material requirements

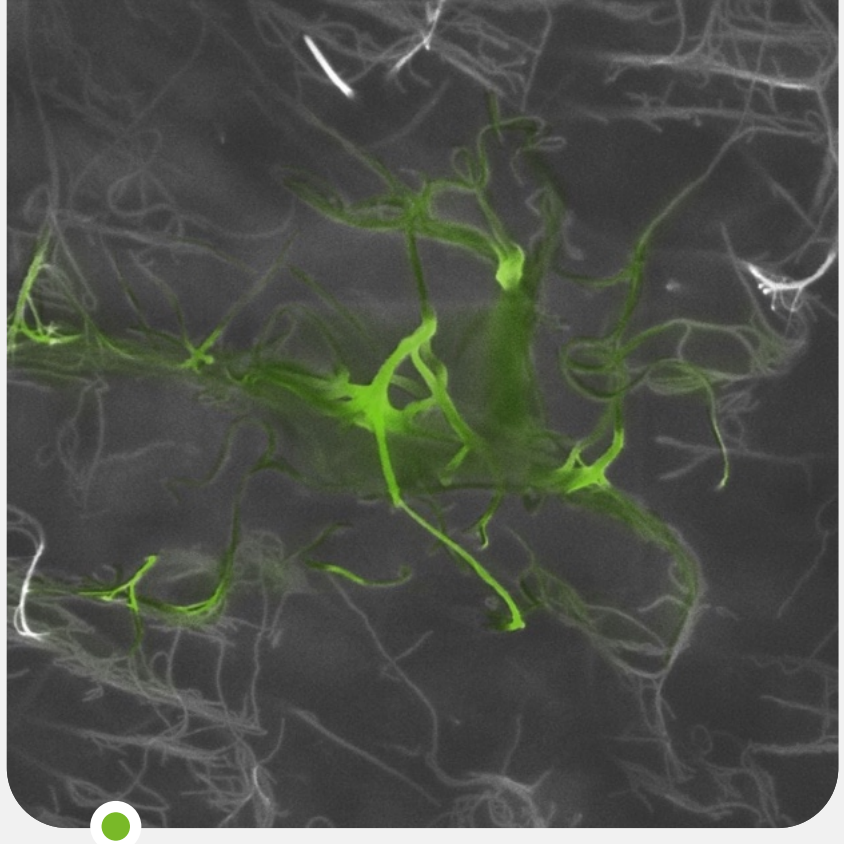
Wearable electronics with human body signals transfer

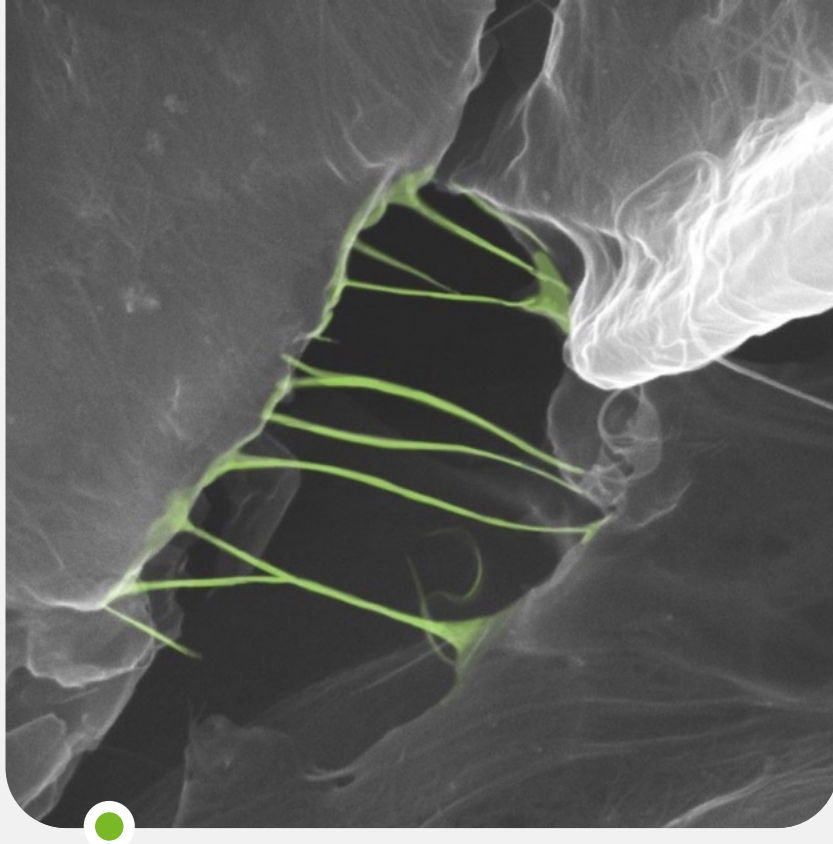
Flexible electrodes in medical and diagnostics equipment

Why TUBALL™ graphene nanotubes?









RUBBER

Conducts electrical current throughout material

COMPOSITES

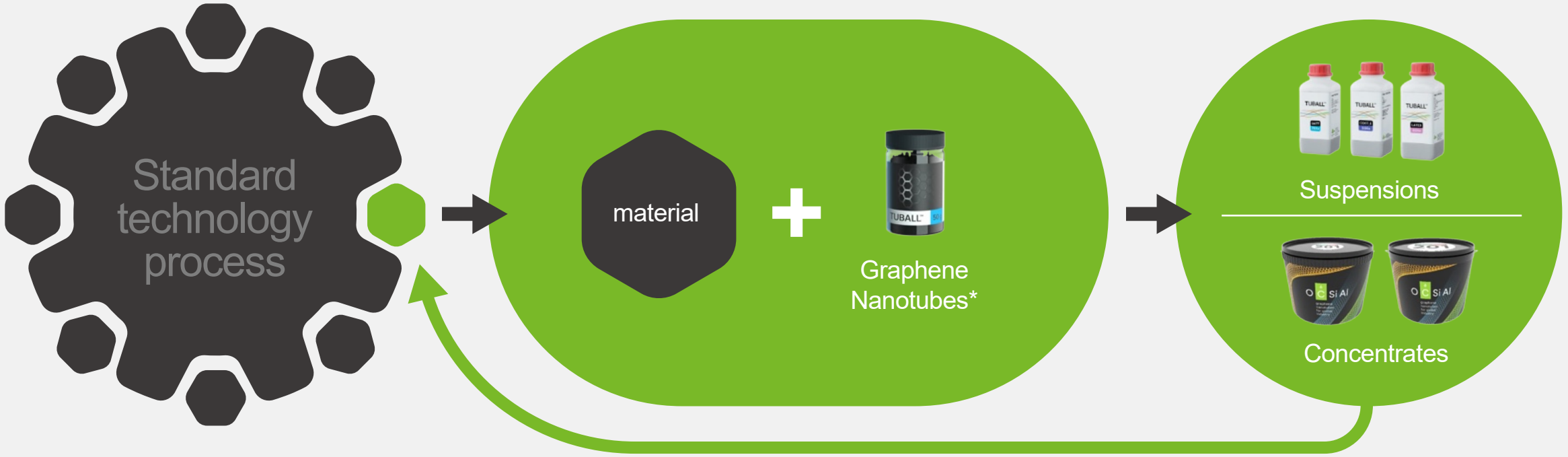
Redirects and suppresses cracks, redistributes the force applied to material

BATTERY ANODE

Binds together particles and reinforces the structure

3D network – multiple effects

Developed technology for easy use



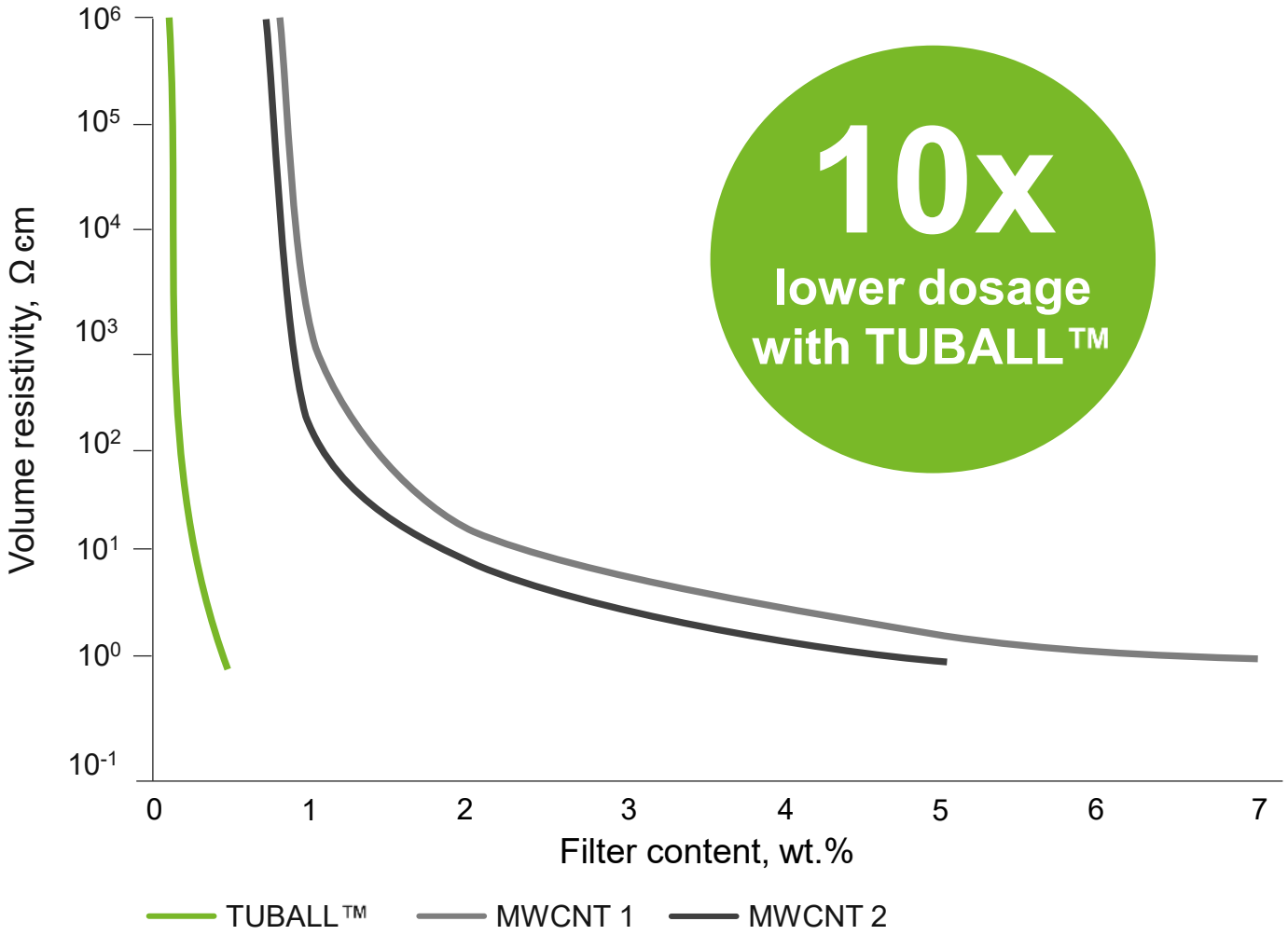
GHG emissions reduction

Graphene nanotubes have a significant impact on reducing the carbon footprint thanks to two effects:

Strength & durability

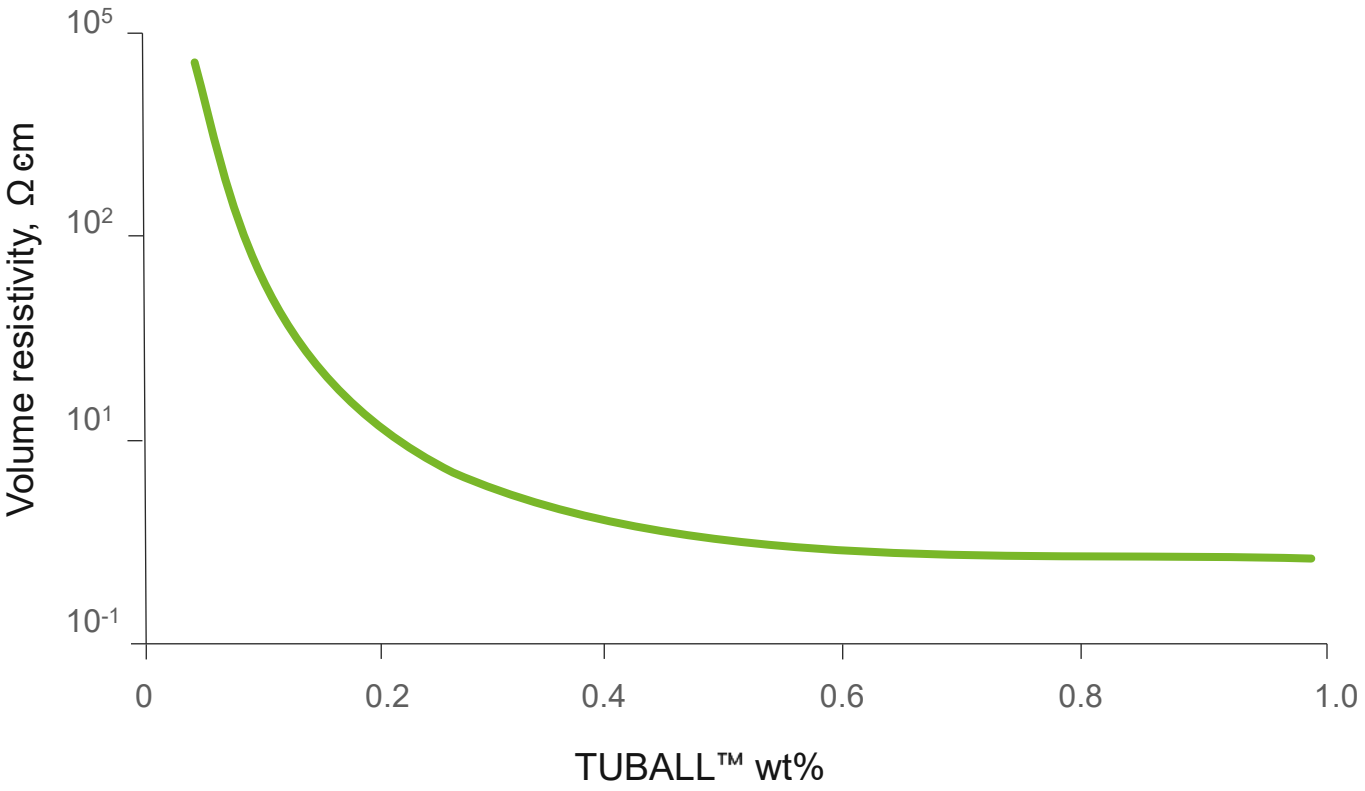
Energy efficiency

Percolation curves for TUBALL™ vs 2 types of MWCNTs



LSR – LR8130, SiSiB. TUBALL™ introduced via TUBALL™ MATRIX 613 beta.

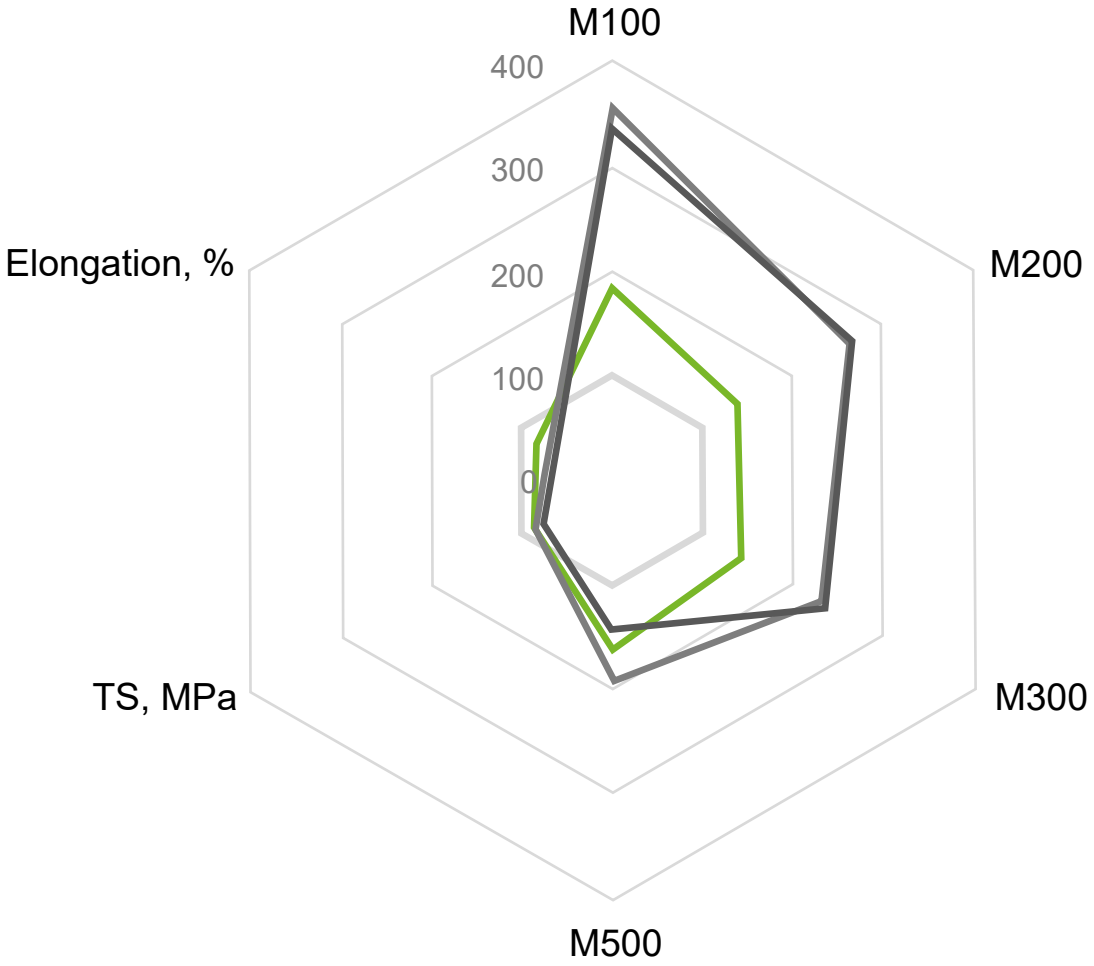
Comparative study in LSR – different nanomaterials

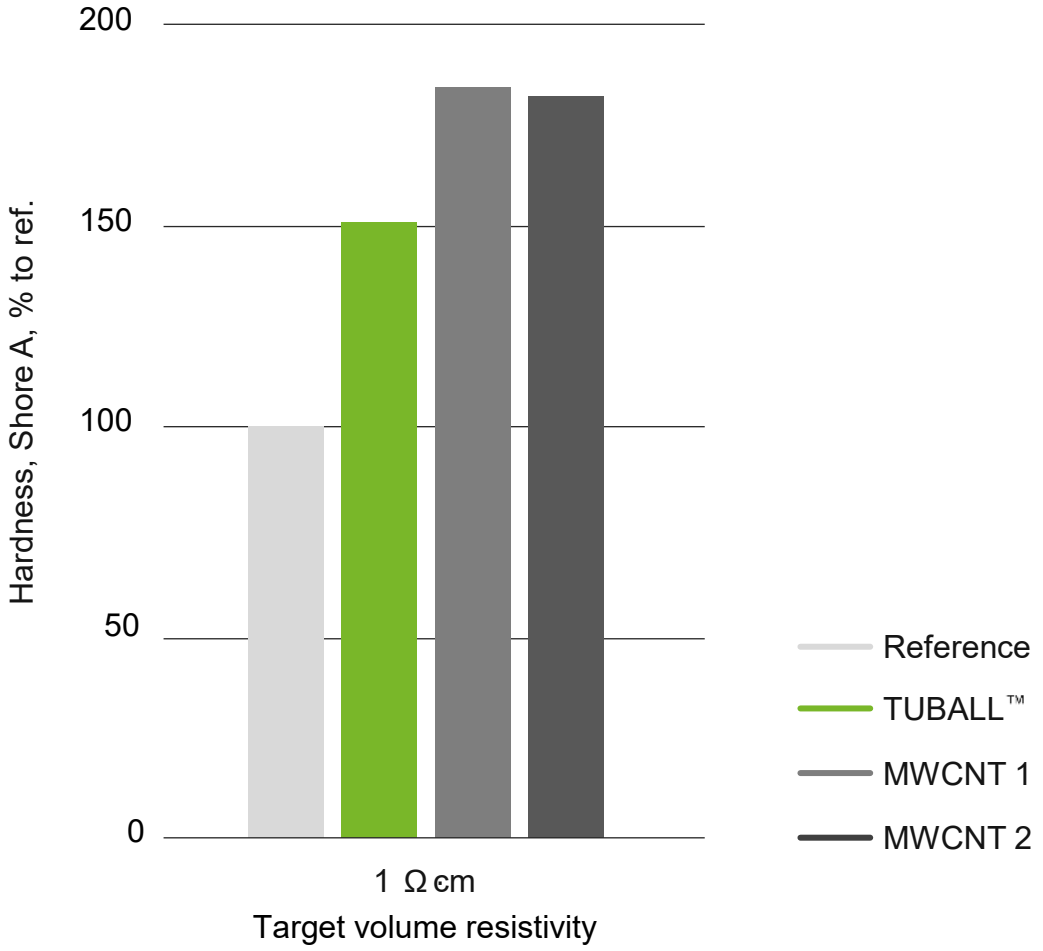


Volume resistivity of LSR with TUBALL™ MATRIX 613

* Tested in LSR Silopren© LSR 2030 (viscosity 350 Pa.s).
Measurements conducted according to ASTM D257, D991 standards

Comparative study in LSR – different nanomaterials



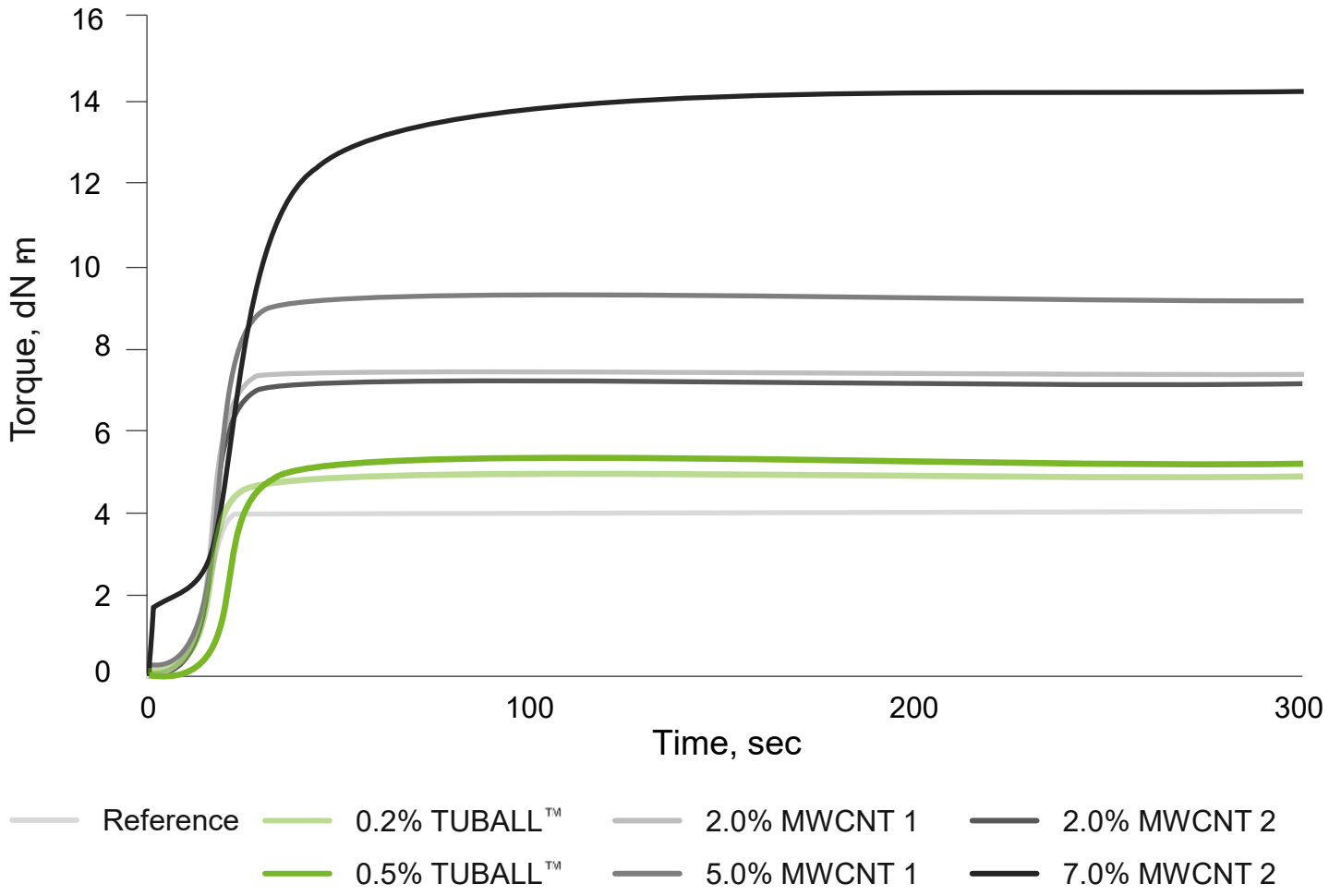


For a target VR of 1 Ω cm, the mono-MWCNT systems significantly affect mechanical properties of LSR

TUBALL™ allows to better maintain the balance of properties of the LSR samples

Comparative study in LSR – different nanomaterials

Rheological properties

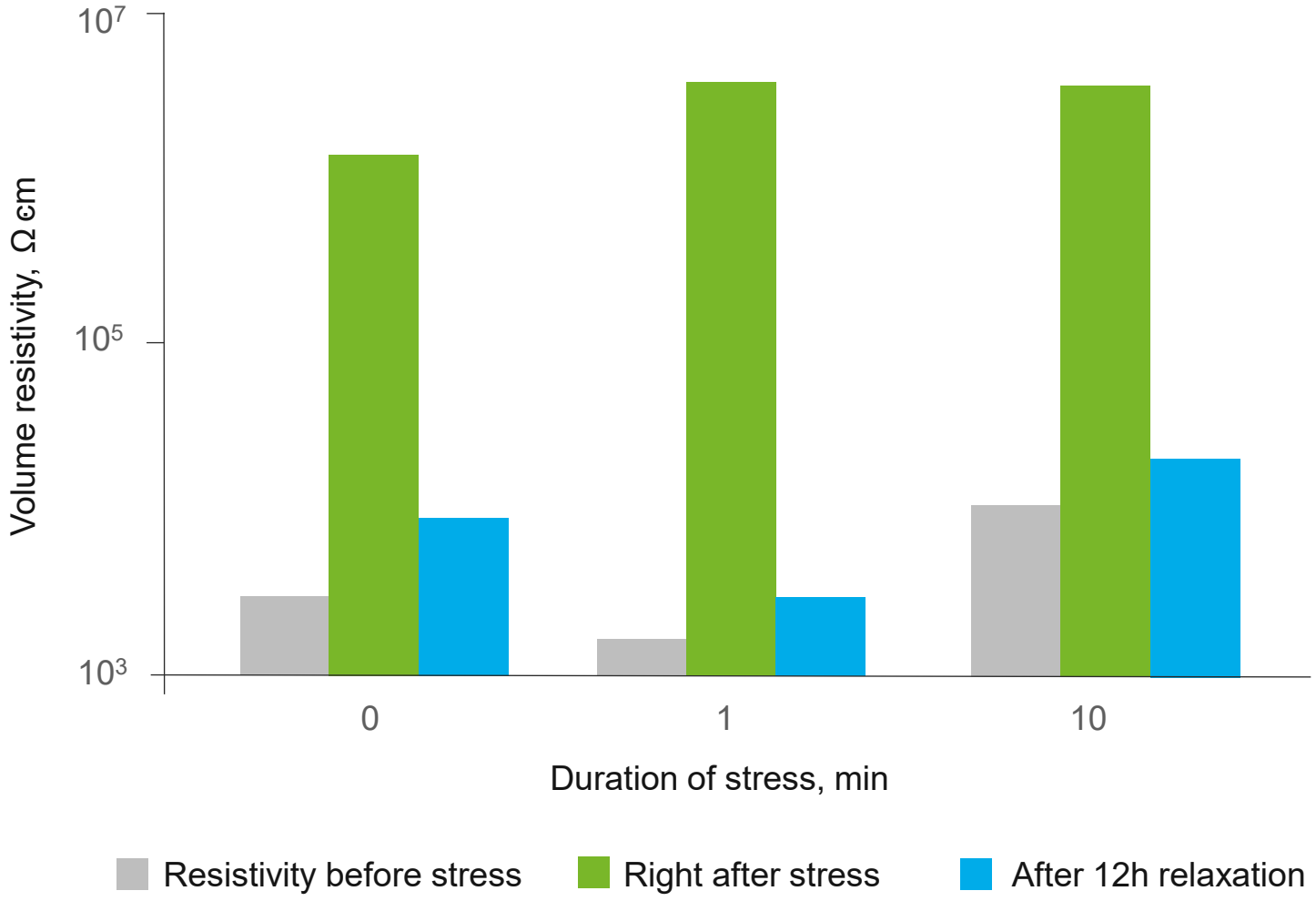


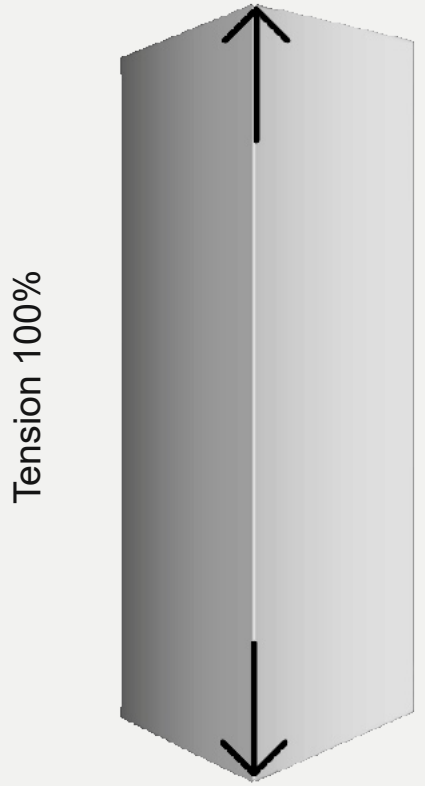
LSR – LR8130, SiSiB. Test conditions: 150°C, 30 min

TUBALL™ has **minimal impact to curing properties** of LSR

Both types of MWCNT have up to 230% impacted curing speed compared to reference

Stable conductive network even after stress





* Tested in Momentive® Silopren LSR 2020

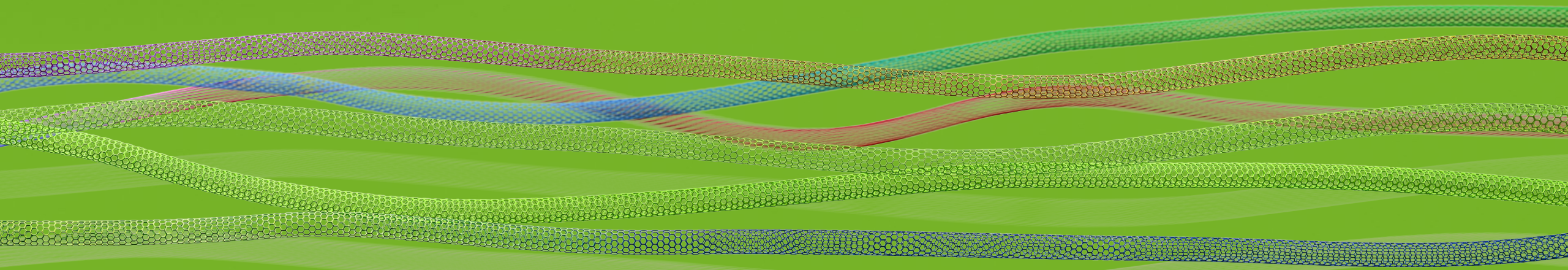
Toxicology assessment of TUBALL™ with respect to skin

NOTE! It is necessary to conduct specific biological and toxicity evaluations of medical/healthcare devices and/or their components. These studies should be initiated by producers of this medical/healthcare devices, according to local regulations.

Tests passed with TUBALL™ (powder form):

- Skin corrosion (OECD 431)
- Skin irritation (OECD 439)
- Skin sensitization (OECD 406)
- Acute dermal toxicity (OECD 403)

EHS status



Product safety

No exposure, no release of free nanotubes – Assessed by external labs:

- VITO (BE), 2017: Abrasion of tread compound samples
- ARDL (USA), 2023: Lab Wear of tires

No Hazard Classification according to the present CLP/GHS regulations

TUBALL™ has a large international chemical inventory status, including EU and US

REACH COMPLIANCE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EHS global leadership

NIA
Nanotechnology Industries Association

SUNSHINE
Safe and Sustainable Design for Advanced Materials

cea

DIAGONAL

STAT PEEL®
MATERIAL-SELECTIVE DETECTION SYSTEM

INERIS
maîtriser le risque pour un développement durable

PATROLS
Advanced Tools for NanoSafety Testing

Intertek

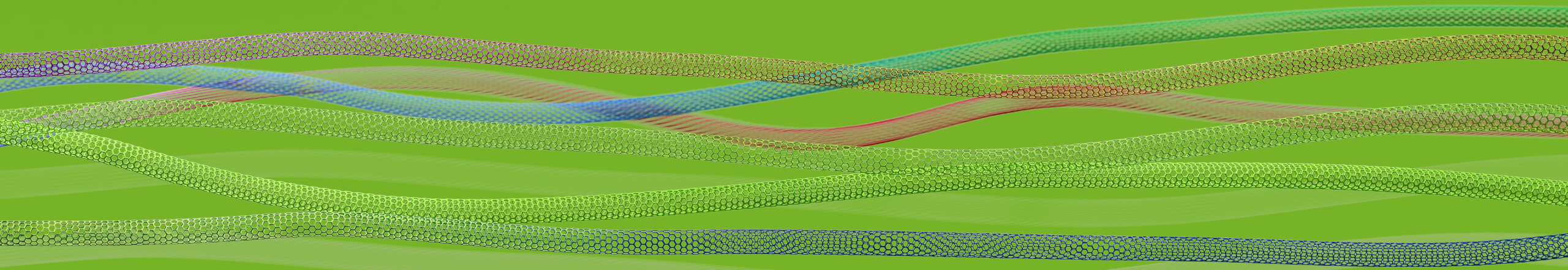
baua:
Bundesanstalt für Arbeitsschutz und Arbeitsmedizin

National Institute for Occupational Safety and Health
NIOSH

Chemical inventory status of TUBALL™

Country or Region	Current Tonnage Band	Chemical Inventory/ Register	Status/ Level
EU	≤ 1 000 MT/year	REACH	Compliant to A. VIII
USA	Unlimited	TSCA	Listed (confidential) – SNUR
Canada	<100 kg/year	DSL	Planned to submit – Schedule IV
Australia	<1 Mt/year*	AICIS	Application ID LTD/2154
Japan	n.a.	CSCL / MITI	Existing element – Carbon
China	n.a.	IECSC	Existing element – Carbon
South Korea	<10 Mt/year	K-REACH / OSHA	Existing element
Turkey	<10 Mt/year	KKDIK (pre-notification)	Registration No. 05-0000186875-25-0000 since June 2023
UK	10–100 Mt/year	UK-REACH	Submitted DUIN (UK-REACH planned prior to 27 Oct 2027)

What can we bring together to circularity ?

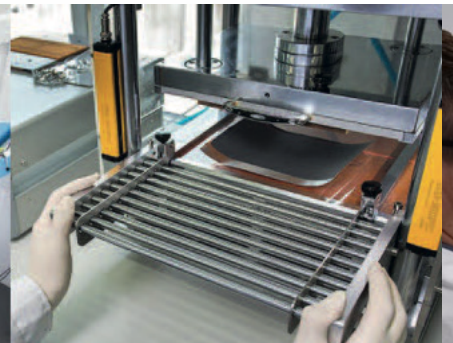


OCSiAl R&D and Technical support

The OCSiAl R&D Department comprises more than 30 scientists specializing in physics, chemistry, and materials science.
OCSiAl R&D and Technical support are concentrated in TUBALL Centres, hubs for production technology development and new material prototyping.

Located in Luxembourg, Serbia, and China – regions with high demand for graphene nanotube solutions – they manage the full development chain, from fundamental research to fine-tuning TUBALL™ applications in pilot industrial lines.




Downstream products

Based on the core technology of GNT synthesis, OCSiAl has developed a family of TUBALL™-based products for different industries

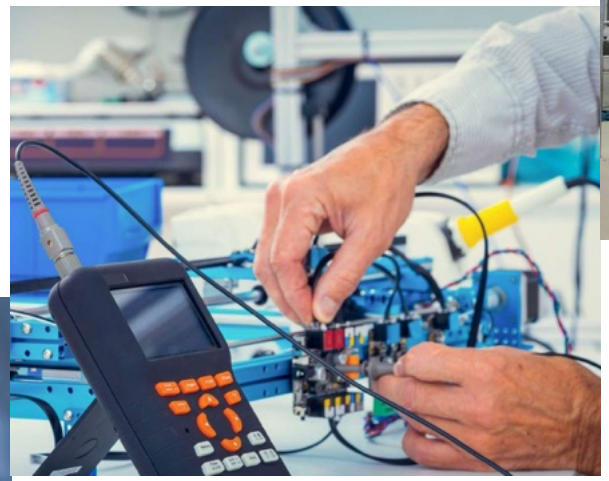
TUBALL™ MATRIX
is a pre-dispersed concentrate for medium and high viscosity, and even solid applications

TUBALL™-based suspensions
are for high solvent or water content applications

Development of industrial solutions

Technical task formulation

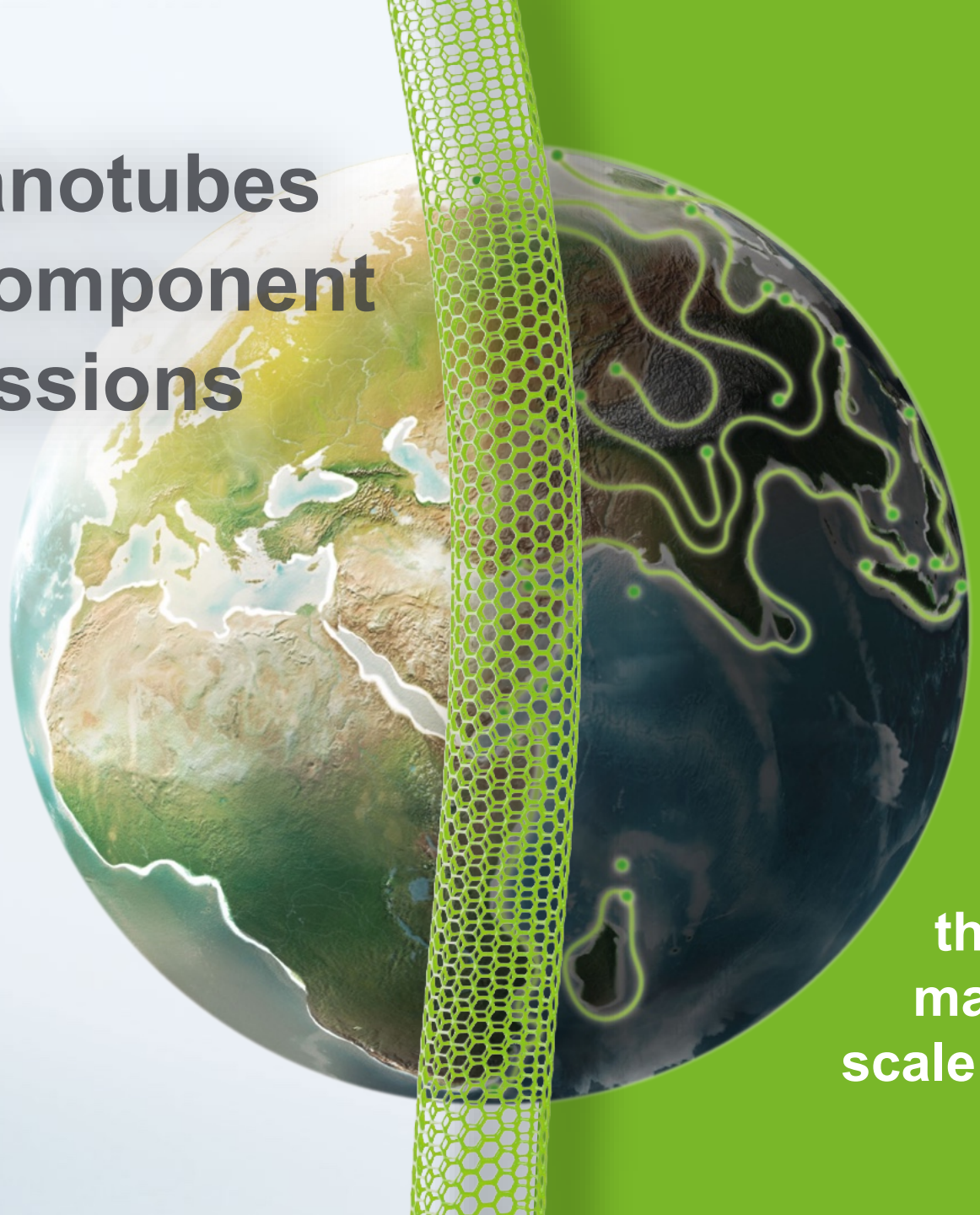
Feasibility study
& prototyping



Product scaling

New industrial solution release

Graphene nanotubes are critical component for GHG emissions reduction



OCSiAl produces this game changing material in industrial scale at affordable cost

HALL 08
BOOTH 815

ocsial.com

tuball.com