

O **6** C Si Al

carbon
nanomaterials
for the global
industry

TUBALL™ NANOTUBES

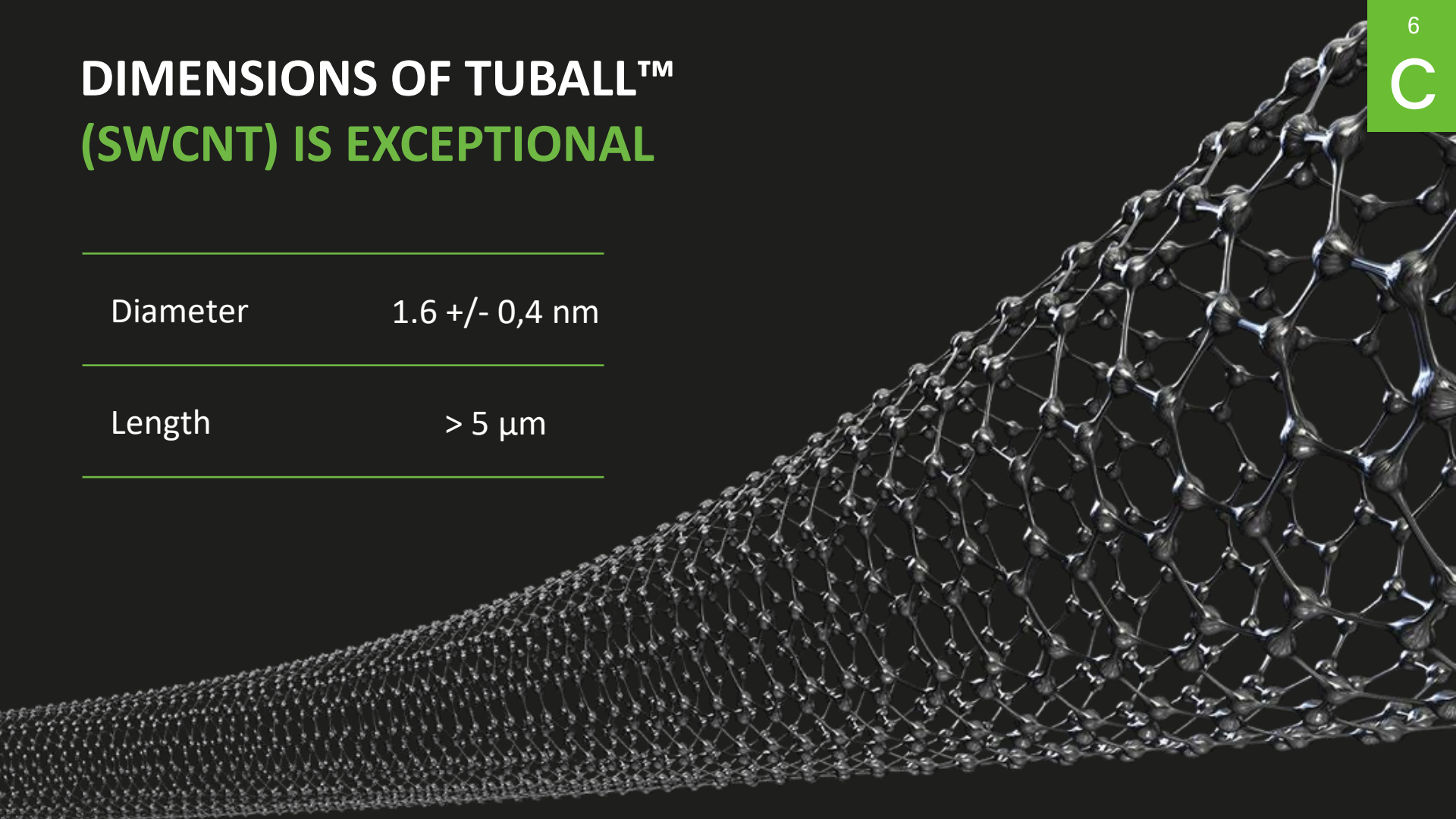
HEALTH, SAFETY & ENVIRONMENTAL STATUS

of OCSiAl S.à r.l.
1 Rue de la Poudrerie, L-3364
Leudelange, Grand-Duché de
Luxembourg

DIMENSIONS OF TUBALL™ (SWCNT) IS EXCEPTIONAL

Diameter 1.6 +/- 0,4 nm

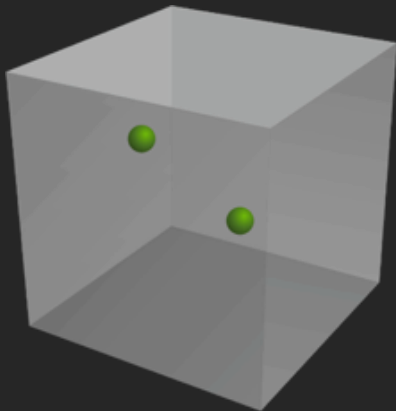
Length > 5 μm



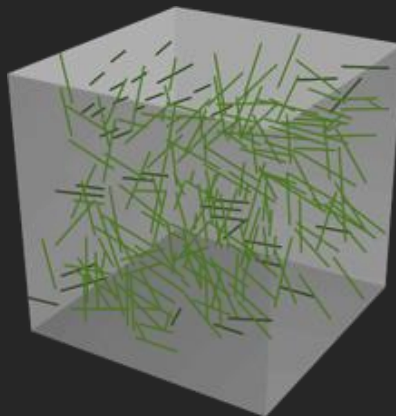
SWCNT DISPERSION IN MATRIX

The same
concentration of
particles (~0.1%)
in the same
volume

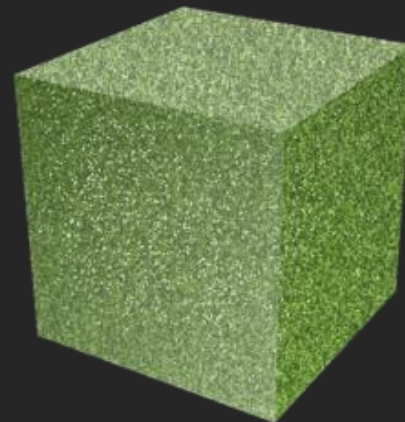
METAL FILLERS



CARBON FIBERS



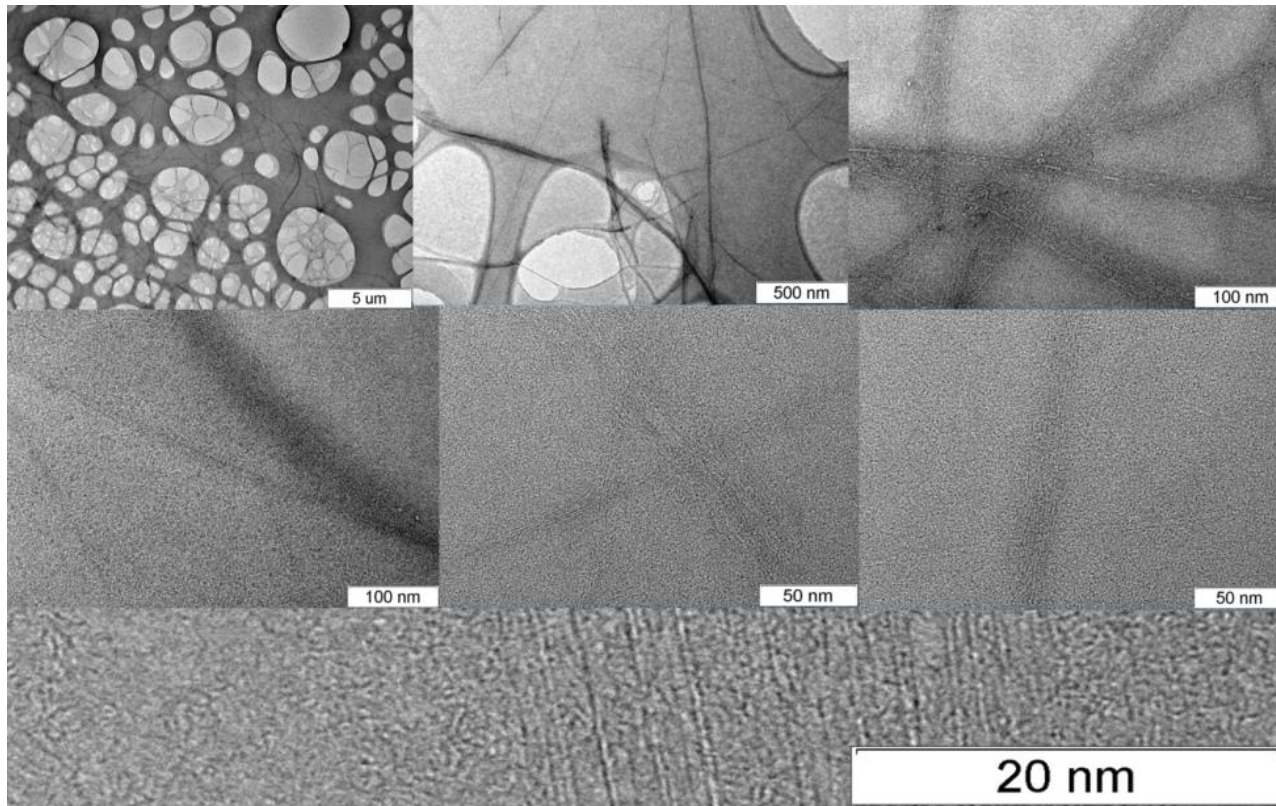
SWCNT TUBALL™



3D NETWORK AT ULTRA-LOW CONCENTRATIONS

The performance space begins to expand
Use less, do more, perform better

TUBALL™ EXCEPTIONAL PROPERTIES

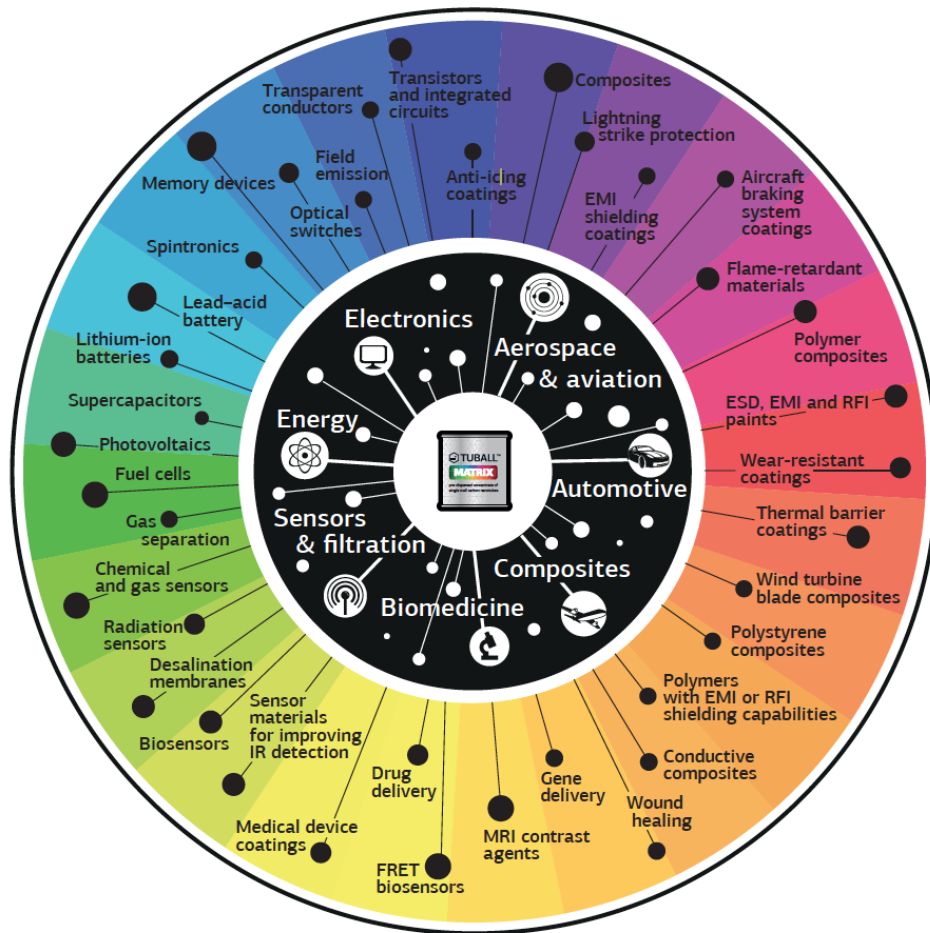


**TEM Images
of dispersed TUBALL™:**

Water based suspension
of Tuball

TUBALL™

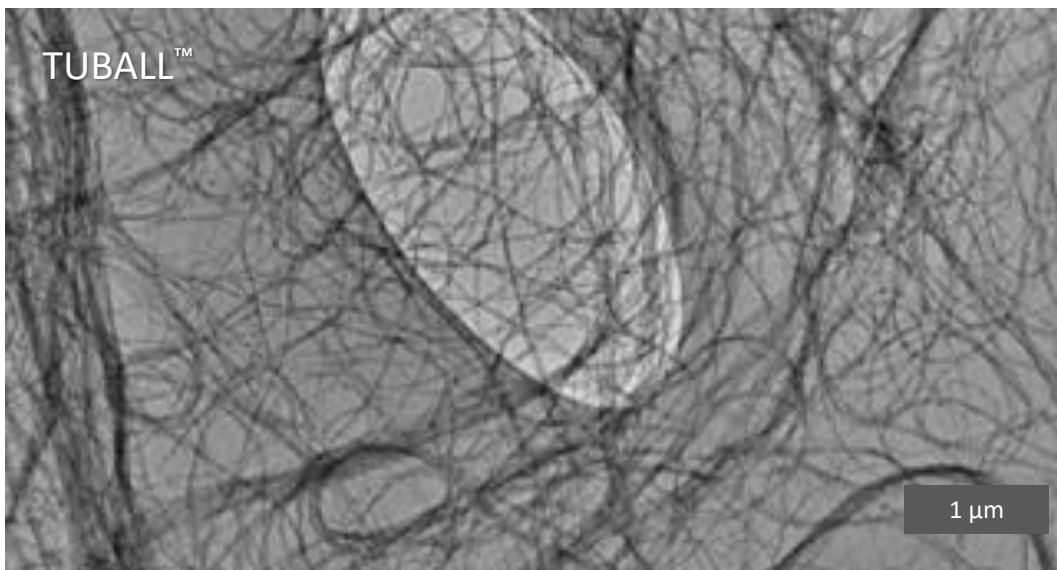
APPLICATIONS: ONE ADDITIVE FOR THOUSANDS OF MATERIALS



TUBALL™

POWDER - SWCNT

WHAT ARE THE PARAMETERS FOR ASSESSING THE RIGIDITY?

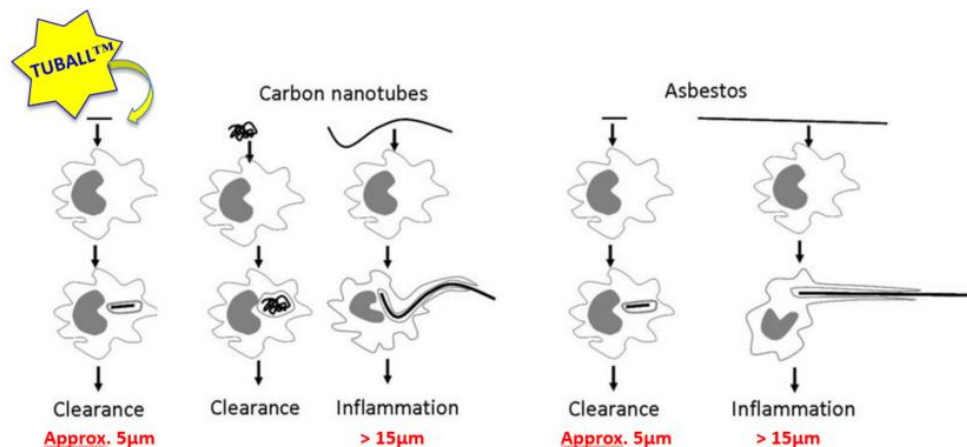
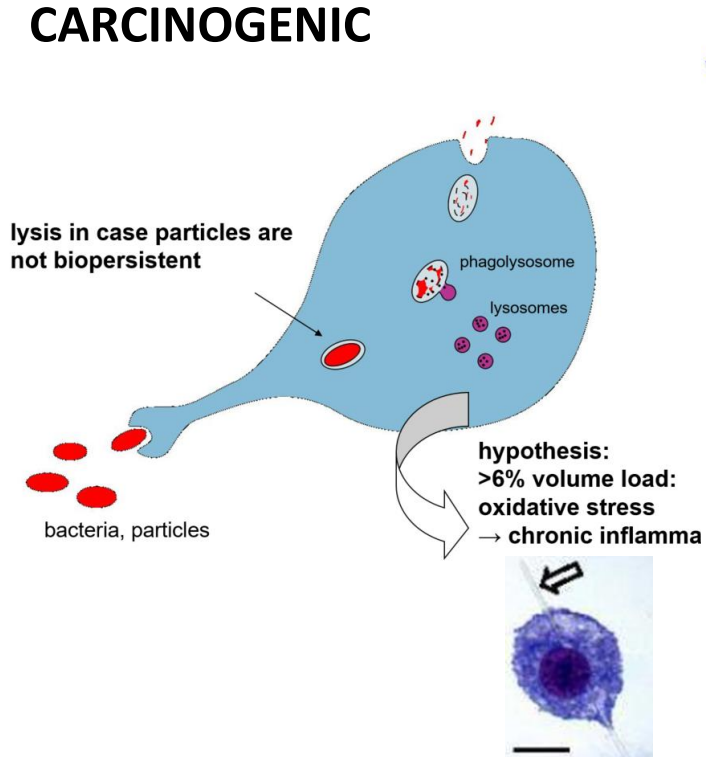


TEM picture of TUBALL™

→ **NOT RIGID**

MORPHOLOGY AND FLEXIBILITY OF TUBALL™ (SWCNT) ^{1/2}

A LONG RIGID BIOPERSISTENT WHO* FIBER HAS TO BE CONSIDERED CARCINOGENIC



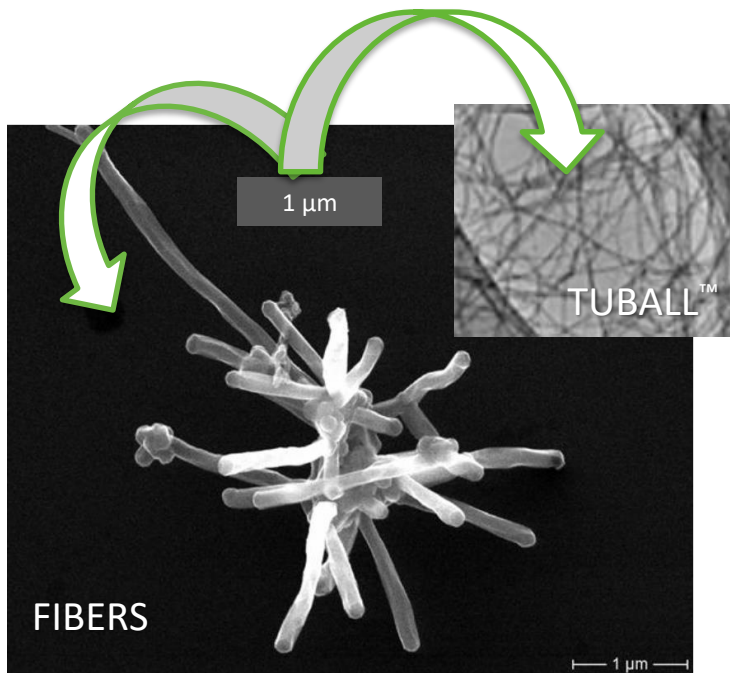
The frustrated phagocytosis paradigm as it relates to long and short fibres of asbestos (right) and various forms of carbon nanotubes (left). When confronted by short asbestos fibres, short carbon nanotube (as Tuball) or tangled, compact carbon nanotube 'particles' the macrophage can enclose them and clear them. However the macrophage cannot extend itself sufficiently to enclose long asbestos or long nanotubes, resulting in incomplete or frustrated phagocytosis, which leads to inflammation.

(Modified from Donaldson et al. Particle and Fibre Toxicology 2010, 7:5.)

(*) **WHO** dimension, length >5 µm, diameter < 3 µm, a L:D ratio larger than 3:1

Bio-persistence: the ability of a substance to remain in the lung → **bio-persistent**

MORPHOLOGY AND FLEXIBILITY OF TUBALL™ (SWCNT) 2/2



Rigid: acts like asbestos high carcinogenic potency

TUBALL™ are NOT rigid fibers

CURRENTLY NOT CLASSIFIABLE
as to its **CARCINOGENICITY TO HUMANS**


TUBALL™ DO NOT BEHAVE LIKE ASBESTOS FIBERS DUE TO NON-RIGIDITY

NO INDICATION FOR ANY CARCINOGENIC RISK ASSOCIATED WITH OUR MATERIAL TODAY


HS&E ASPECTS OF TUBALL™ (SWCNT)

CYTOTOXICITY SCREENING OF 19 NM's - Publication Aug. 2017

- SWCNT is non-cytotoxic!
- All CNTs do not induce potent inflammatory responses!
- SWCNT show a lower toxicity in certain *in vitro* experiments (Cytotoxicity in THP cells)



Nanotoxicology



ISSN: 1743-5390 (Print) 1743-5404 (Online) journal homepage: <http://www.tandfonline.com/doi/nao20>


Cytotoxicity screening and cytokine profiling of nineteen nanomaterials enables hazard ranking and grouping based on inflammogenic potential


Kunal Bhattacharya, Gözde Kiliç, Pedro M. Costa & Bengt Fadeel


To cite this article: Kunal Bhattacharya, Gözde Kiliç, Pedro M. Costa & Bengt Fadeel (2017) Cytotoxicity screening and cytokine profiling of nineteen nanomaterials enables hazard ranking and grouping based on inflammogenic potential, *Nanotoxicology*, 11:6, 809-826


To link to this article: <http://dx.doi.org/10.1080/17435390.2017.1363302>


© 2017 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group


 [View supplementary material](#)

 Published online: 17 Aug 2017.

 [Submit your article to this journal](#)

 Article views: 698

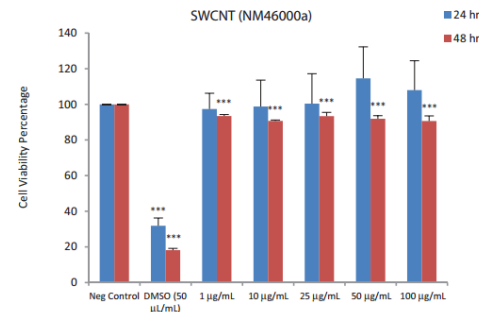
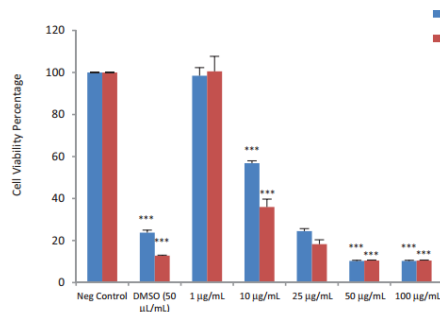
 [View related articles](#)

 [View Crossmark data](#)

Full Terms & Conditions of access and use can be found at <http://www.tandfonline.com/action/journalInformation?journalCode=nan20>

Download by: [91.181.178.97]

Date: 03 November 2017, At: 00:55



REGISTRATIONS AND COMPLIANCE

REACH (EU) AND EPA (USA)

- TUBALL™ is compliant in the EU for commercial sales with a tonnage band up to 10 tons/a!
- REACH registered since 29 of September 2016!
This is a milestone for the OCSiAl Group and Nanotechnology sector, in general — the first for SWCNTs — for up to 10 tons pa!
- NEW goal is to be upgraded for a tonnage band up to 1000 tons pa in Q4 2018
- US_EPA has consented TUBALL of OCSiAl , will placed on the confidential TSCA inventory after receiving the SNUR in December 2018;
- The PMN includes rigorous testing -> amongst others is the mandatory 90-days toxicity by inhalation study!
- OCSiAl is committed to comply with the Canada-CEPA regulations NSN requirements - schedule IV & V;
- TUBALL™ passed in many different nanomaterial registers (Like Belgium, France, Swiss,);
- And any other country regulation where we plan to do business.



**OCSiA CARES ABOUT
THE HEALTH, SAFETY, AND THE
ENVIRONMENTAL ASPECTS**

OCSiAl CONDUCTED TESTS IN 2017

TEST OVERVIEW OF 2017			
TEST SUBSTANCE/ PRODUCT	ASSISTANCE OF	TEST	TEST CONCLUSION
POLYMER MATRICES CONTAINED TUBALL™	VITO	PRODUCT TEST — MECHANICAL ABRASION ON EP/HDPE/RUBBER (TYRE)	NO EFFECT
	VITO	PRODUCT TEST — DRILL ON EP/HDPE	NO EFFECT
	VITO	PRODUCT TEST — SPILL OF WATER-BASED SUSPENSION	NO EFFECT
TUBALL™	OCSiAl - STATPEEL	TUBALL™ HANDLING & PROCESS SIMULATIONS – 1 ST SERIES	ON GOING

NANOSAFETY PRODUCT TESTING



For example: **abrasion test**

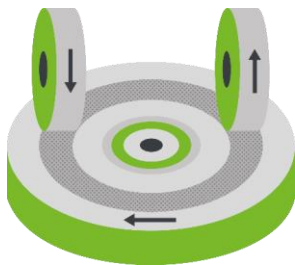


Figure 1: Taber abraser (schematic)

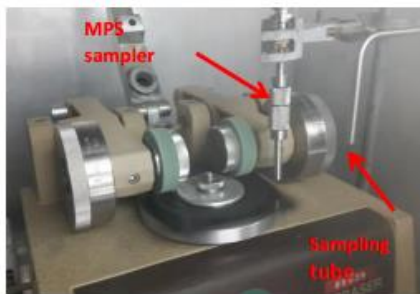
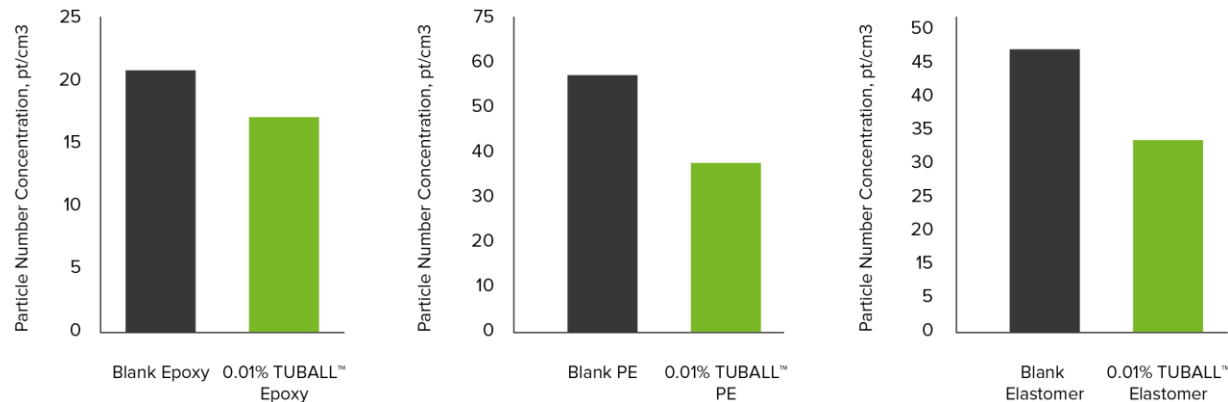


Figure 2: Test set-up with Aerosol sampling tube



- Simulation of typical handling (sliding, walking, polishing, rolling)
- Released nanoparticles detected and quantified
- Test method from DIN68861-2:1981, ISO 5470-1:1999, ASTM D4060-95:2007
- Taber abraser type Teledyne Taber model 5130

Other nanosafety product testing were also conducted like drilling of nanocomposites

NANOSAFETY PRODUCT TESTING



Conclusion

Hardly any micron sized particles were released during the abrading of the blank and Tuball™ containing epoxy, polyethylene and elastomer.

As shown by the results of the real time measurements limited nano and micron sized particles were released during taber abrading resulting in a low deposition efficiency on the grids.

TEM ANALYSIS SHOWED SOME MICRON SIZED PARTICLES, BUT NO PROTRUDING OR FREE STANDING SWCNT'S WERE FOUND!

OCSiA TESTPLANS FOR 2018

TEST OVERVIEW 2018

TEST SUBSTANCE/ PRODUCT	ASSISTANCE OF	TEST	TEST CONCLUSION
TUBALL™	BAuA	TOXICITY STUDY BY INHALATION	TO BE STARTED Q1/2018
	BAuA	DUSTINESS TESTING TUBALL™ SUBSTANCE	TO BE STARTED 2018
POLYMER MATRICES CONTAINED TUBALL™	OCSiA - STATPEEL	TUBALL™ HANDLING & PROCESS SIMULATIONS - 2 nd SERIES	ON GOING
	VITO	DETERMINE MECHANICAL STRENGTH OF DIFFERENT POLYMERS CONTAINING TUBALL™	TO BE STARTED 2018
TUBALL™ - PAPER	INERIS	PRODUCT TEST — SLITTING PROCESS DURING PRODUCTION OF TUBALL™ PAPER	TO BE STARTED Q2/2018
TUBALL™	NEED TO BE SELECTED	OECD 413 90DAYS INHALATION TOXICITY IN VIVO STUDY	ON GOING
TUBALL™	HSL UK / TNO	DUSTINESS TESTING TUBALL™ SUBSTANCE (requested by EPA)	TO BE STARTED 2018
POLYMER MATRICES CONTAINED TUBALL™	VITO	LIFE CYCLE ASSESSMENT	TO BE STARTED 2018
	INERIS	WEATHERING TESTING	TO BE STARTED 2018
	INERIS	ECO-TOXICOLOGIC STUDY — ALGAE & DAPHNIA ON NEW/AGED EP/HDPE/RUBBER	TO BE STARTED 2018-2019
	INERIS	INCENERATION ON EP/HDPE/RUBBER (TYRE)	TO BE STARTED 2018
	INERIS	COMBUSTION ON EP/HDPE/RUBBER (TYRE)	TO BE STARTED 2018

OCSiAI CARES FOR PEOPLE & ENVIRONMENT

- OCSiAI has started-up a corporation with **INERIS**, well known French Research center, with the necessary expertise to find answers on a few extra Health & Safety issues that we like to clear out;
- Associated partner of the EC funded project "**EC4SafeNano**" ~ since Nov. 2016;
- One of the industry **representatives** in many conferences, workshops, NM-meetings, ...
- First discussion were made with **NIOSH: National institute of Occupational S&H**, **HSL: HIS - HSE's UK Health and Safety** & **STATPEEL** Swiss, show a lot of interests.



TAKE HOME MESSAGE

- OCSiAl cares for people and environment, shows a **pro-active attitude** towards HS&E questions;
- **No cytotoxicity - No inflammation** of (SW)CNT according recent study ~ *published Aug. '17*;
- IARC → SWCNT are **not classifiable** as to its carcinogenicity to humans ~ *published Sept. '16*;
- WHO criteria apply to Tuball ?
BUT WHO fibers show big differences → **NON RIGID**;
- **REACH** registration as the first for SWCNT ~ *published Sept. '16*
- Tuball soon listed on the confidential **TSCA** inventory ~ *planned end '17* ;
- Professional users/consumers are not exposed of **protruding nor free standing** SWCNTs were found ~ *published March 17*;

TAKE HOME MESSAGE

- A lot of mandatory **studies are planned** involving tonnage band upgrade and to be compliant with new substance notification ;
- A lot of **additional studies/testings** are planned to ease the concerns of our customers;
- OCSiAl is **involved** in many projects and different workgroups;
- The board of appeal (ECHA) mention no consistent causal link yet been established between **size** and **hazardous** properties! → **NOT BECAUSE IT'S A NANOMATERIAL THAT IT IS HAZARDOUS!!** ~ *published June 17.*

CONCLUSIONS only valid for Tuball™

THANK YOU!

H&S QUESTIONS OR PROBLEMS OR INTERESTS?

CONTACT ME:

Gunther Van Kerckhove

HS&E Lead manager

+352 661 183 429

Skype: gvksafety