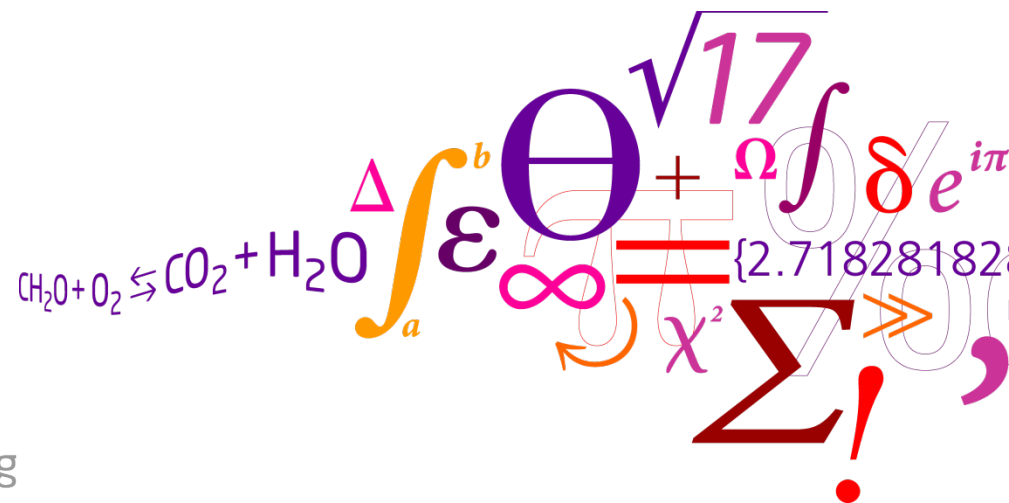


Nanoproducts – What is Actually Available to European Consumers?

Steffen Foss Hansen, Laura Roverskov Heggelund,
Alexander Newcombe, Aiga Mackevica, Alessio Boldrin,
Anders Baun



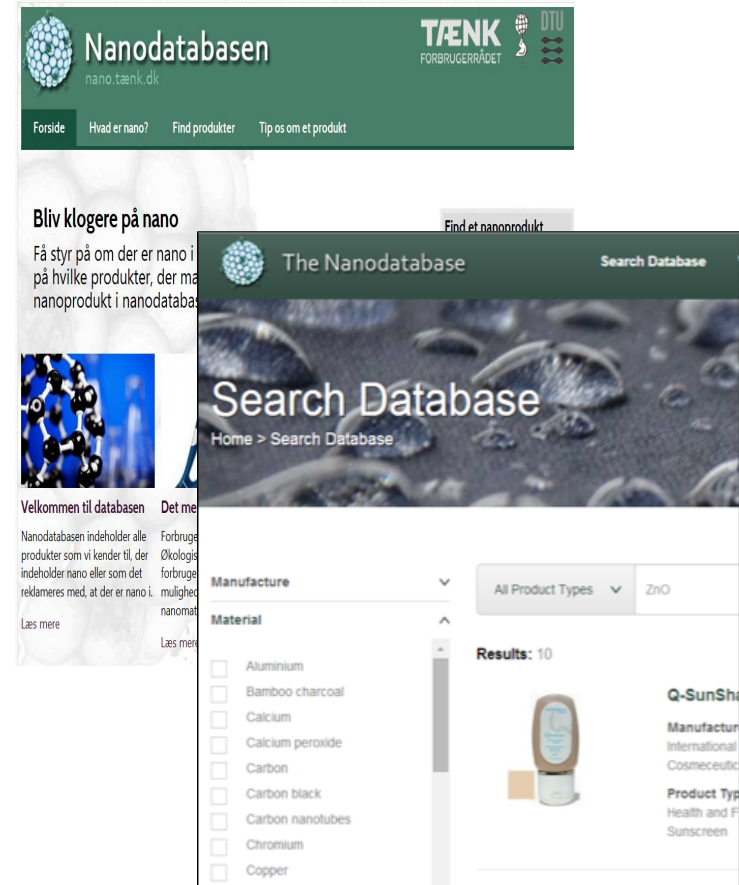
Nanoproducts

- **Unclear** what is on the market
- **Unclear** what consumers are exposed to
- **Unclear** how much consumers are exposed to
- **Hampers quantitative consumer exposure assessment**



The Nanoproductdatabase (www.nanodb.dk)

- 2012: Initiated "The Nanodatabase"
- DTU Environment
- The DK Ecocouncil & The DK Consumer Council



The screenshot displays the Nanodatabase website interface. At the top, there is a green header with the logo 'Nanodatabasen nano.tænk.dk' and the logo for 'TÆNK FORBRUGERRÅDET' (The Danish Consumer Council) and 'DTU'. Below the header, there are navigation links: 'Forside', 'Hvad er nano?', 'Find produkter', and 'Tip os om et produkt'. The main content area features a search bar with the text 'Find et nanoproduct' and a search button. Below the search bar, there is a section titled 'Search Database' with a breadcrumb trail 'Home > Search Database'. On the left side, there is a list of filters under the heading 'Material', including Aluminium, Bamboo charcoal, Calcium, Calcium peroxide, Carbon, Carbon black, Carbon nanotubes, Chromium, and Copper. On the right side, there is a search result for 'ZnO' with a product image and the text 'Results: 10'. The product image shows a bottle of sunscreen, and the text next to it reads 'Q-SunSh International Cosmeceutic Health and F Sunscreen'.



Methodology

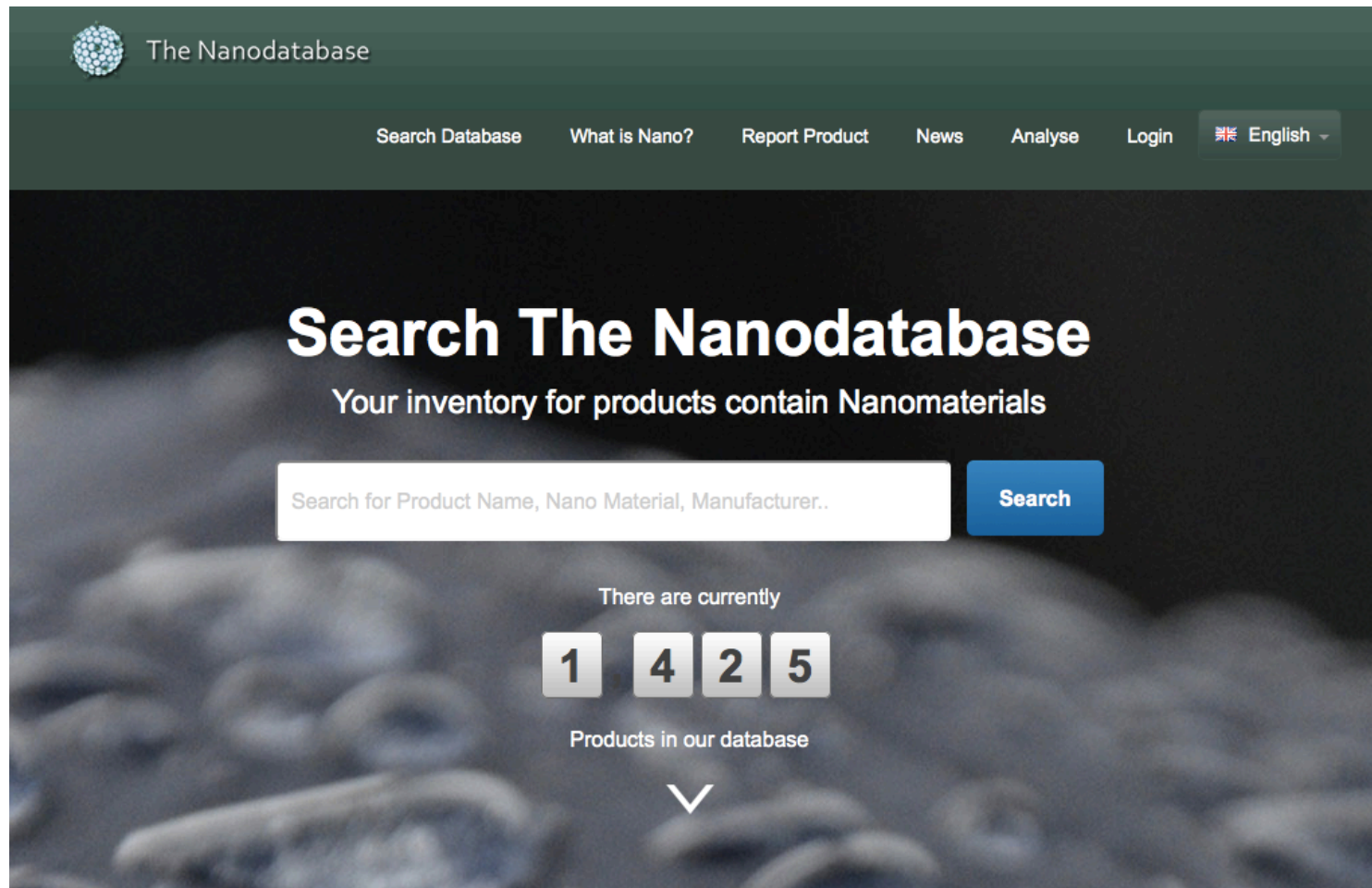
Identifying products:

- Trawled existing databases
- Searching on-line webshops
- Based on "nano-claims"

Criteria for including products:

- There is a "nano-claim"
- Can be purchased by EU consumer





The Nanodatabase

[Search Database](#) [What is Nano?](#) [Report Product](#) [News](#) [Analyse](#) [Login](#) [English](#)

Search The Nanodatabase

Your inventory for products contain Nanomaterials

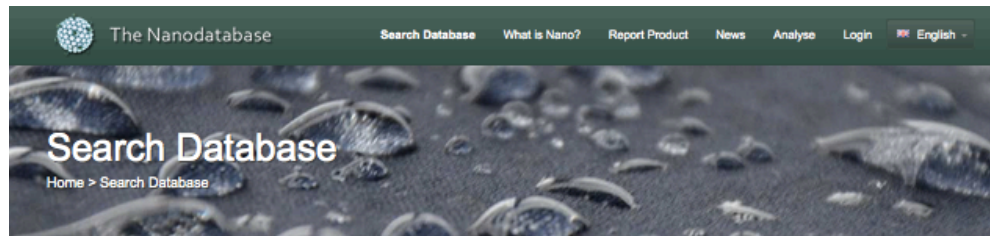
Search for Product Name, Nano Material, Manufacturer.. [Search](#)

There are currently

1 4 2 5

Products in our database

▼



Manufacture All Product Types

Country Of Origin

Country of Production

Material

Location





Potential Exposure Pathways

Waste Materials

Added on or after date

Modified on or after date

Results: 1,425

	BOORA PERMASEAL Manufacturer: Boora Nanomaterial: Polytetrafluoroethylene Product Type: Automotive, Exterior NanoRiskCat: 4 icons
	Good State - Liquid Ionic Minerals Calcium Manufacturer: Good State Nanomaterial: Calcium Product Type: Food and Beverage, Supplements NanoRiskCat: 5 icons
	Good State - Liquid Ionic Calcium Ultra Concentrate Manufacturer: Good State Nanomaterial: Calcium Product Type: Food and Beverage, Supplements NanoRiskCat: 5 icons
	Silvia Osteo Plus Tablets for stronger bones Manufacturer: Silvia Osteo Nanomaterial: Calcium Product Type: Food and Beverage, Supplements NanoRiskCat: 5 icons

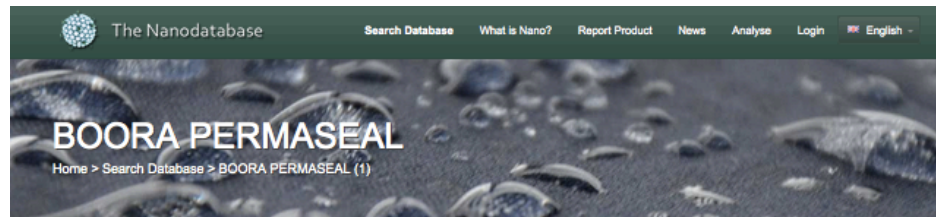




Image Reference



 **Data: Exposure Profile**
-BOORA PERMASEAL (1) _ BOORA PERMASEAL

 **Data: Safety Profile**
- PTFE

BOORA PERMASEAL

Boora Automotive, Exterior / United Kingdom

NanoRiskCat

Exposure			Effects	
Professional	Consumers	Environment	Humans	Environment
				

Nanomaterial

Polytetrafluoroethylene

Evaluation and Location of the Nanoelement

Suspended in liquid

Available in

Denmark, European Union
Link to webshop
[Shop](#)

Waste Material

Plastic from used product containers

Product Information

Sealing Product

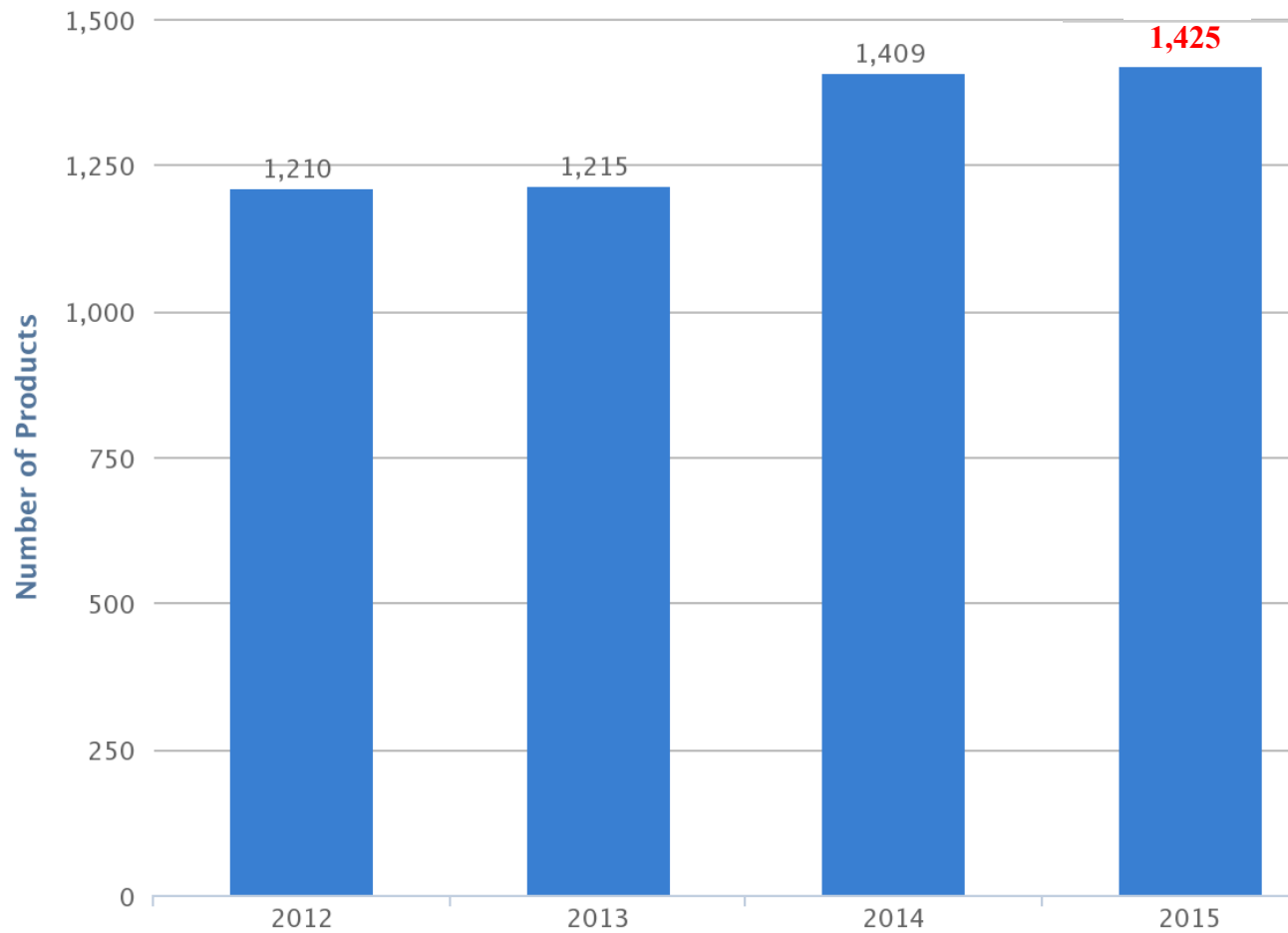
Manufacturer's description

Boora Permaseal 10 Year PTFE Paint Protection System - Forget Car Wax and get 10 Years of PTFE Shine and Protection

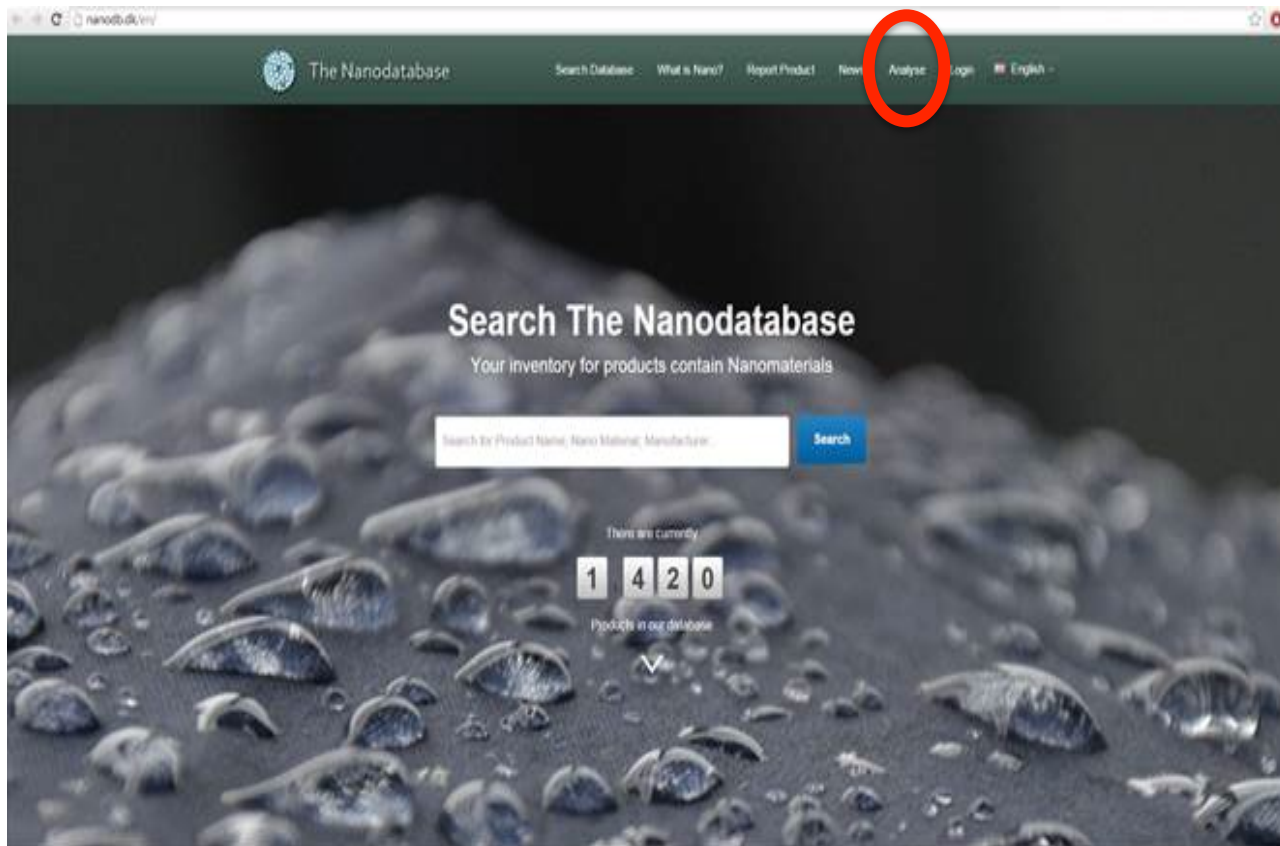
If you are car enthusiast looking for an extremely long-lasting alternative to the traditional car wax and finishing products in the current market, then you have must consider Boora's Permaseal Paint Protection System - the world's best car wax sealant. If you are a professional detailing specialist or maintain a fleet of vehicles which require constant washing, you will understand the durability issue with many cleaning, wax and sealant products in the current market. Maybe you have just purchased a new car, and simply do not want the hassle of waxing and polishing it every couple of months. Whoever you are, we at Boora Car Care know you want long-lasting, deep, diamond-like shine and paintwork protection.

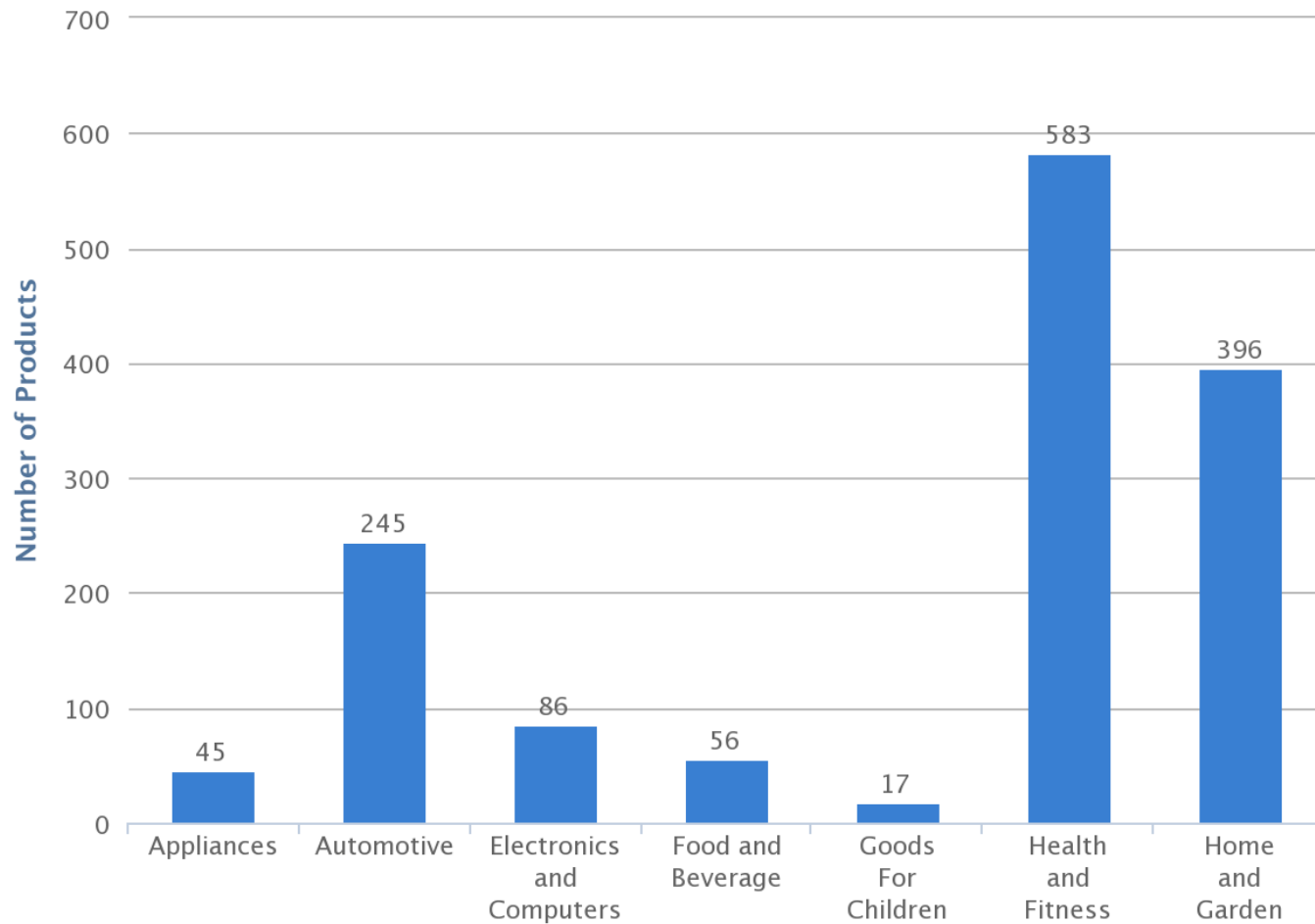
A Little About P.T.F.E.

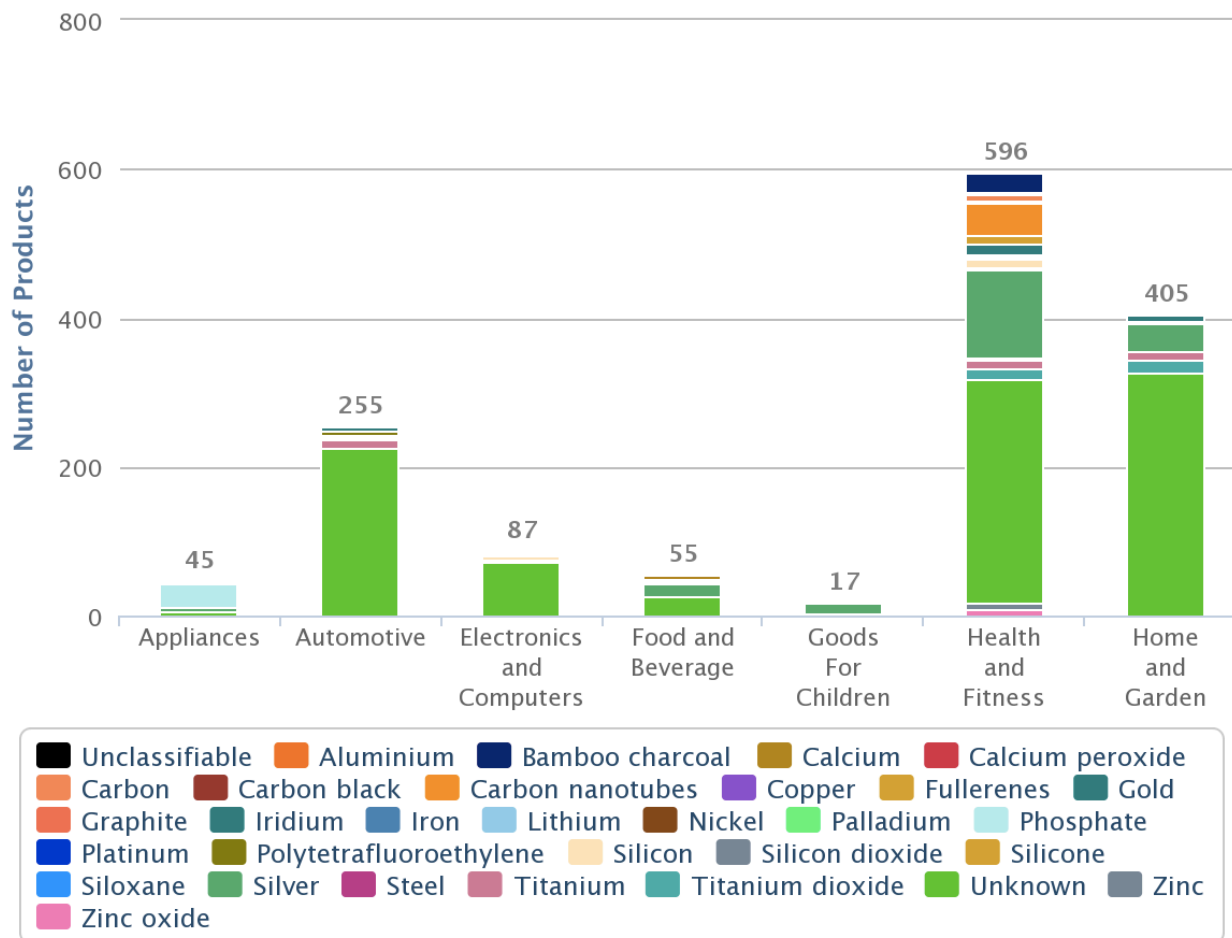
Polytetrafluoroethylene (PTFE) is a synthetic fluoropolymer made famous by the Dupont brand name Teflon. It is a fluorocarbon solid and has a very high molecular weight compound. It is these fluorocarbon combinations which are not susceptible to the London dispersion force, due specifically to the high electronegativity of fluorine. This means that water and other oil based substances cannot 'wet' PTFE, and is the primary reason why this substance is used widely for, primarily, non-stick pans and other cookware. Clearly, this extreme hydrophobic property is also beneficial to the bodywork of cars, not only for protection, but also a long-lasting shine.



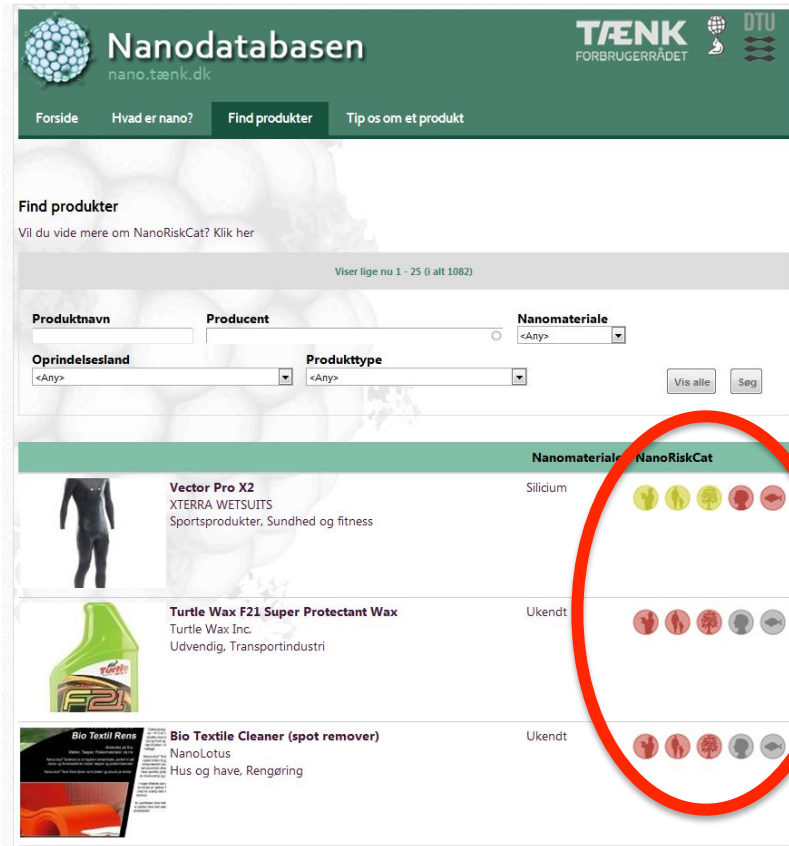
Analysedel af Nanodb.dk







NanoRiskCategorisation



Produktnavn	Producent	Nanomateriale	NanoRiskCat
Vector Pro X2 XTERRA WETSUITS Sportsprodukter, Sundhed og fitness		Silicium	●●●●●●●●
Turtle Wax F21 Super Protectant Wax Turtle Wax Inc. Udvendig, Transportindustri		Ukendt	●●●●●●●●
Bio Textil Rens Bio Textile Cleaner (spot remover) NanoLotus Hus og have, Rengering		Ukendt	●●●●●●●●

J Nanopart Res (2014) 16:2195
DOI 10.1007/s11051-013-2195-z

RESEARCH PAPER

NanoRiskCat: a conceptual tool for categorization and communication of exposure potentials and hazards of nanomaterials in consumer products

Steffen Foss Hansen · Keld Alstrup Jensen · Anders Baun

Received: 14 June 2013 / Accepted: 5 December 2013
© Springer Science+Business Media Dordrecht 2013

Abstract The literature on nano(ecotoxicology) is growing rapidly and has become increasingly difficult to interpret. We have developed a systematic tool called NanoRiskCat that can support companies and regulators in their first-tier assessment and communication on what they know about the hazard and exposure potential of consumer products containing engineered nanomaterials. The final outcome of NanoRiskCat is communicated in the form of a short-title describing the intended use and five colored dots. The first three dots refer to the qualitative exposure potential for professional end-users, consumers and the environment, whereas the last two refers to the hazard potential for humans and the environment. Each dot can be assigned one of four different colors, i.e. red, yellow, green, and gray indicating high, medium, low, and unknown, respectively. In this paper, we first introduce the criteria used to evaluate the exposure potential and the human and environmental hazards of specific uses of the nanoparticle. We then apply NanoRiskCat to eight different nanoproducts. The human and environmental exposure potential was found to be high (i.e., red) for many of the products due to direct application on skin and subsequent environmental release. In the NanoRiskCat evaluation, many of the nanomaterials achieve a red human and environmental hazard profile as there is compelling *in vivo* evidence to associate them with irreversible effects, e.g., carcinogenicity, respiratory, and cardiovascular effects, etc., in laboratory animals. A significant strength of NanoRiskCat is that it can be used even in cases where lack of data is prominent.

Keywords NanoRiskCat · Decision-support tool · Health · Environment · Risk assessment · Exposure potential

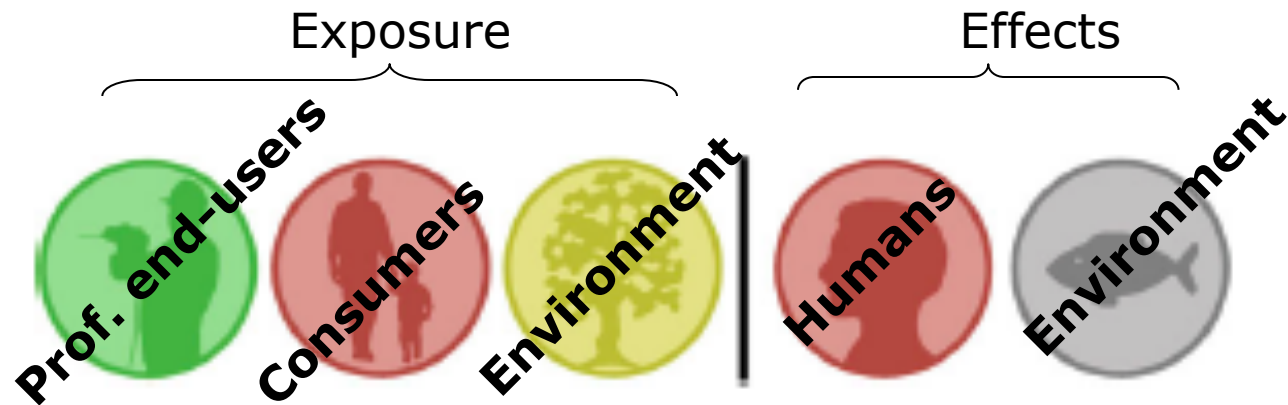
Introduction

Manufactured nanomaterials are used in a rapidly increasing number of products available to industries and private consumers and the diversity of commercialized nanomaterials and products is immense. More and more evidence has emerged in the scientific literature that some nanomaterials might have hazardous properties (for a comprehensive review, see Stone et al. 2010; Mikkeben et al. 2011; SCHER, SCENHR, and SCCS 2013). However, it is a great challenge to clearly extract and communicate the essence of exposure and hazard information efficiently. Traditional risk assessment prone to increase as the material passes into the environment or down-stream to the industrial user, importer, vendor, consumer, and end of life. Previously, there has not been a systematic approach for zinc, and gold. Therefore, we present the application of NanoRiskCat on eight different nanoproducts—one product for each of the seven most used nanomaterials in consumer products as well as one product for which

Fig. 1 Example of a NanoRiskCat evaluation on exposure and hazard potential for a given nanoproduct. The first three colored dots always refer to the exposure potential during intended use for professional end-users, consumers and the environment, respectively. The last two dots refer to the apparent hazard potential for humans and the environment, respectively. Each dot can be assigned one of four different colors and the colors red, yellow, green, and gray indicate high, medium, low, and unknown, respectively

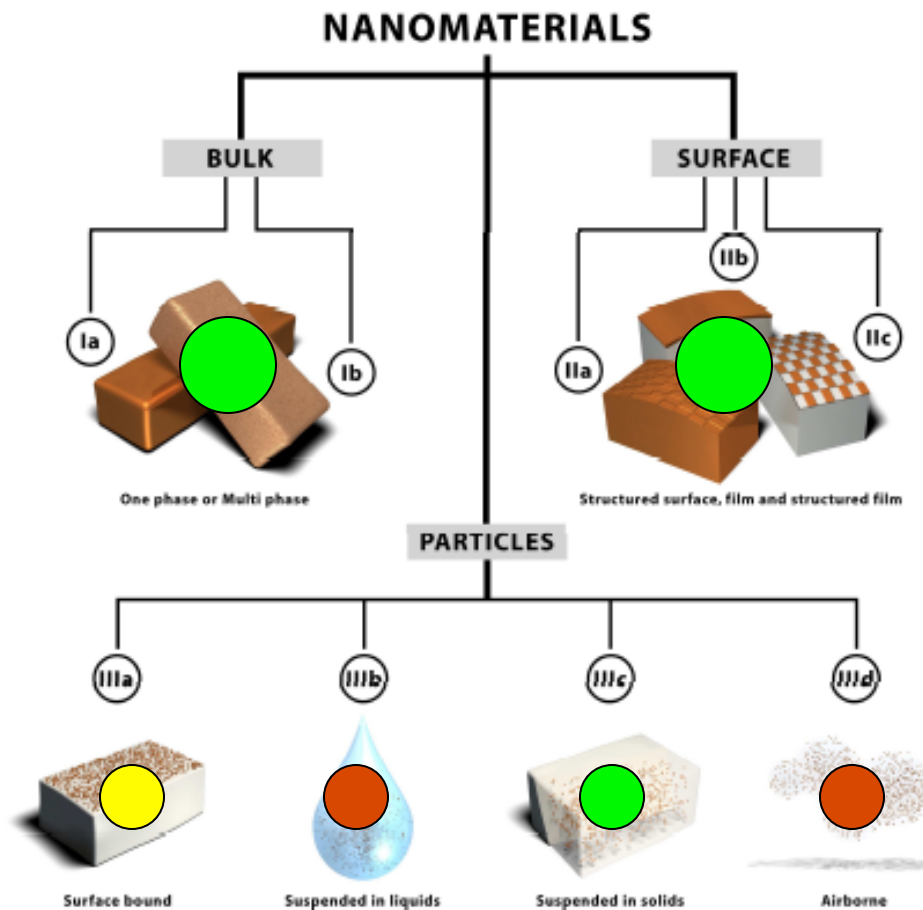
Springer

NanoRiskCat



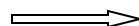
-  = High
-  = Medium
-  = Low
-  = Unknown

Determining exposure

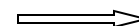


Examples of determining exposure

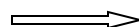
- TiO₂ in sunscreen



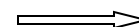
Suspended in liquids



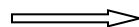
- C60 lubricants



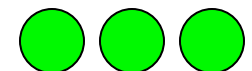
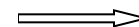
Suspended in liquids

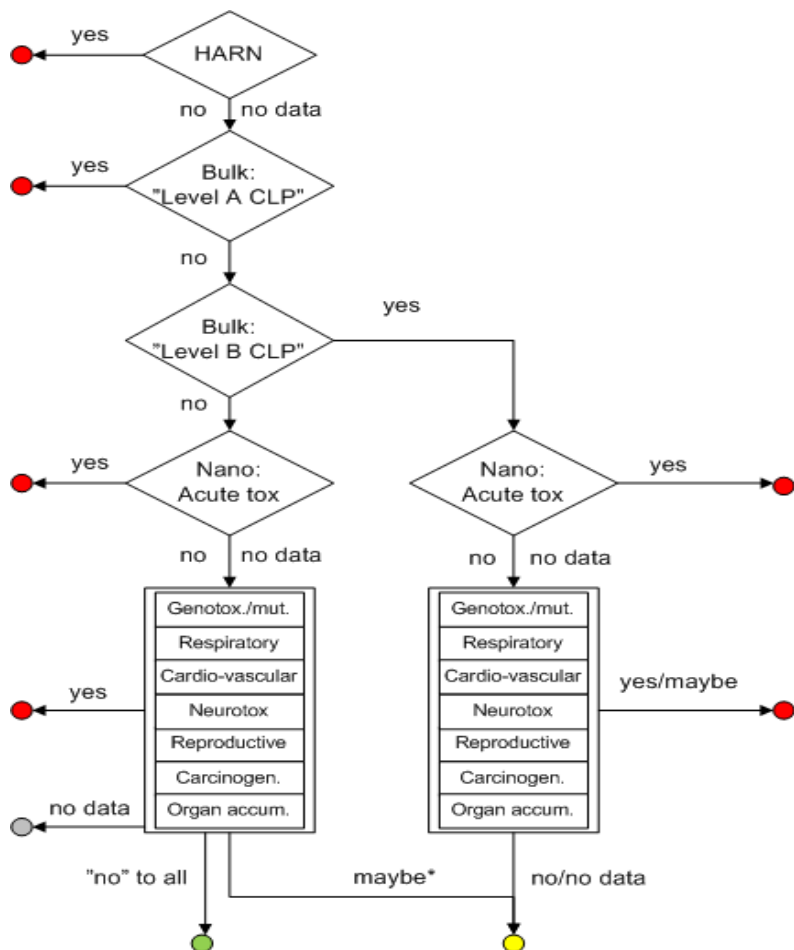


- CNT baseball bats



Suspended in solids

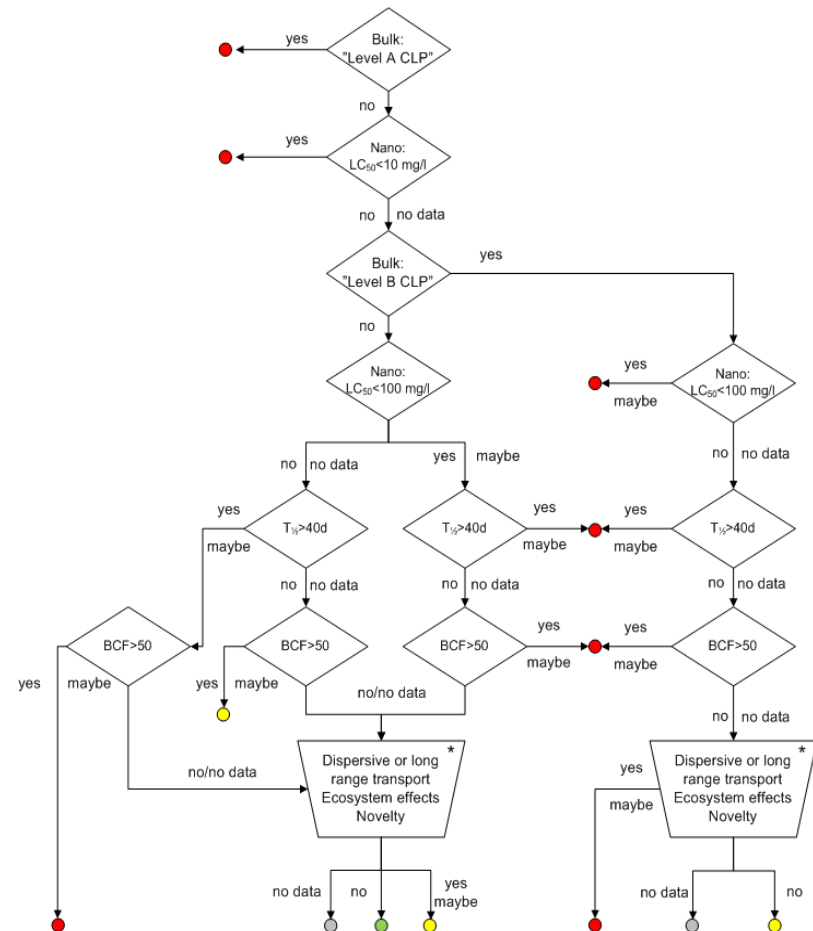




- NM HARN?
- Bulk CLP?
- NM Acute tox?
- NM associated with:
 - CMR?
 - Respiratory tox?
 - CVD?
 - Neurotox?
 - Organ accumulation?

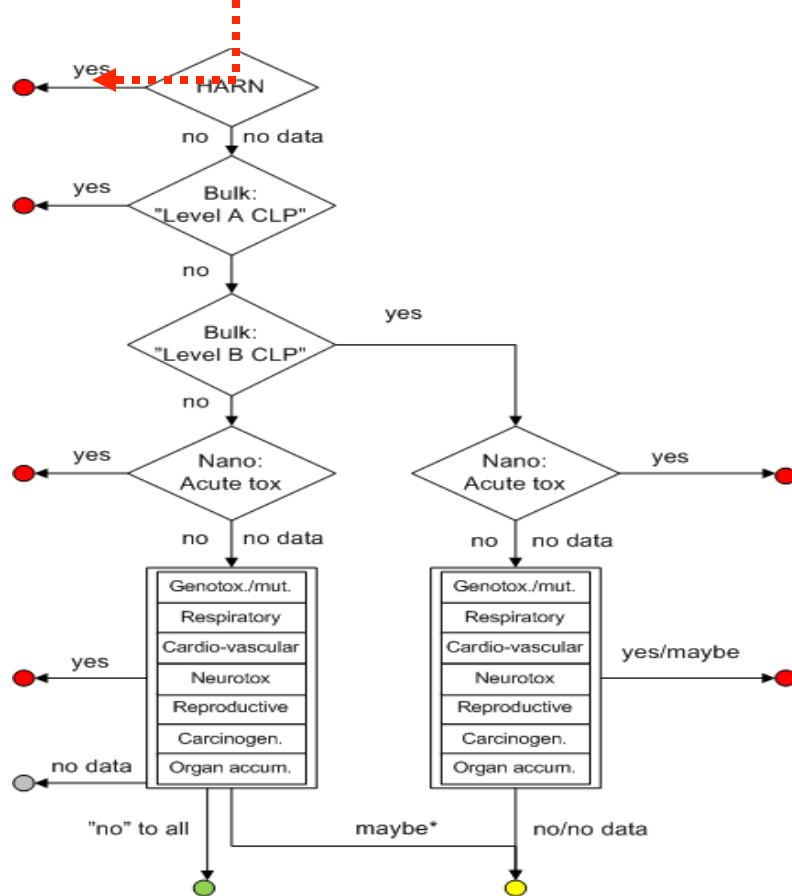


- Bulk GLP?
- Bulk $LC_{50} < 10 \text{ mg/l}$?
- NM $LC_{50} < 100 \text{ mg/l}$?
- NM $T_{1/2} > 40 \text{ days}$?
- NM $BCF > 50$?
- NM dispersive?
- NM ecosystem effects?
- NM novel?

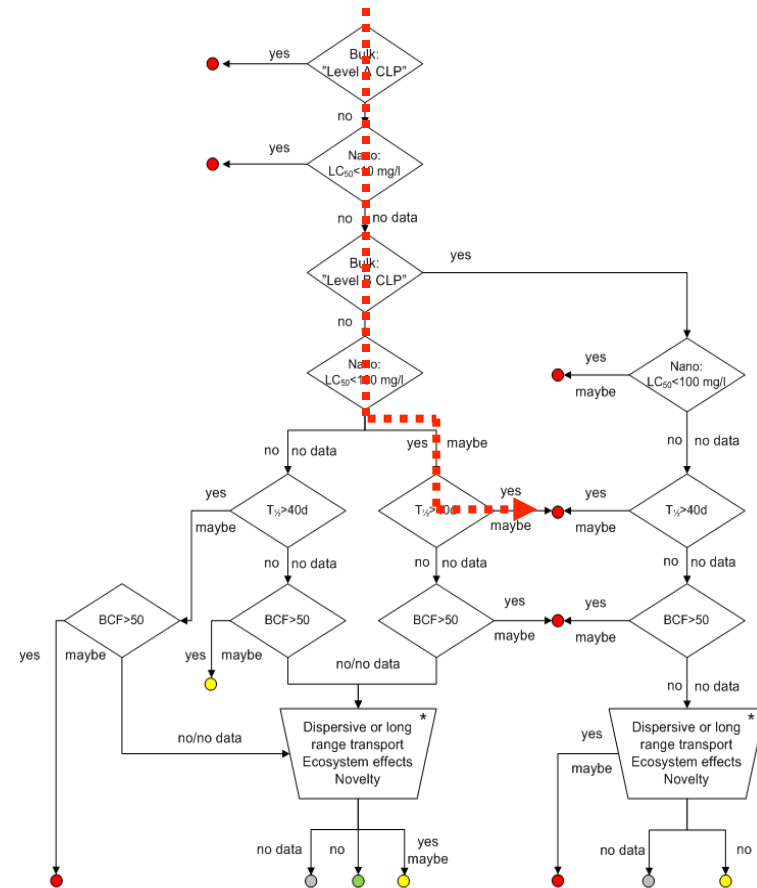


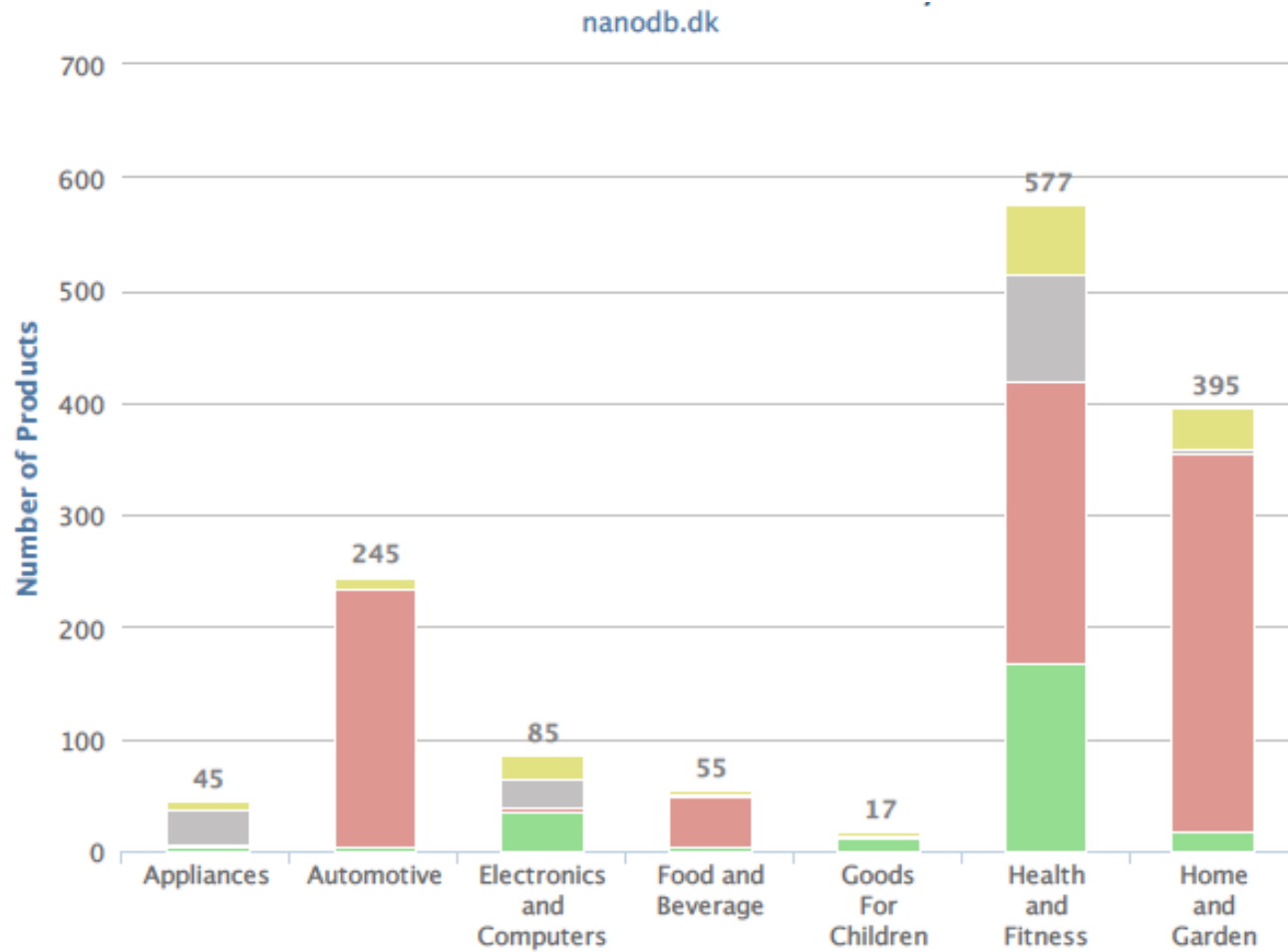
CNT - HARN, Ecotox = < 100 mg/l, T1/2 >40 d

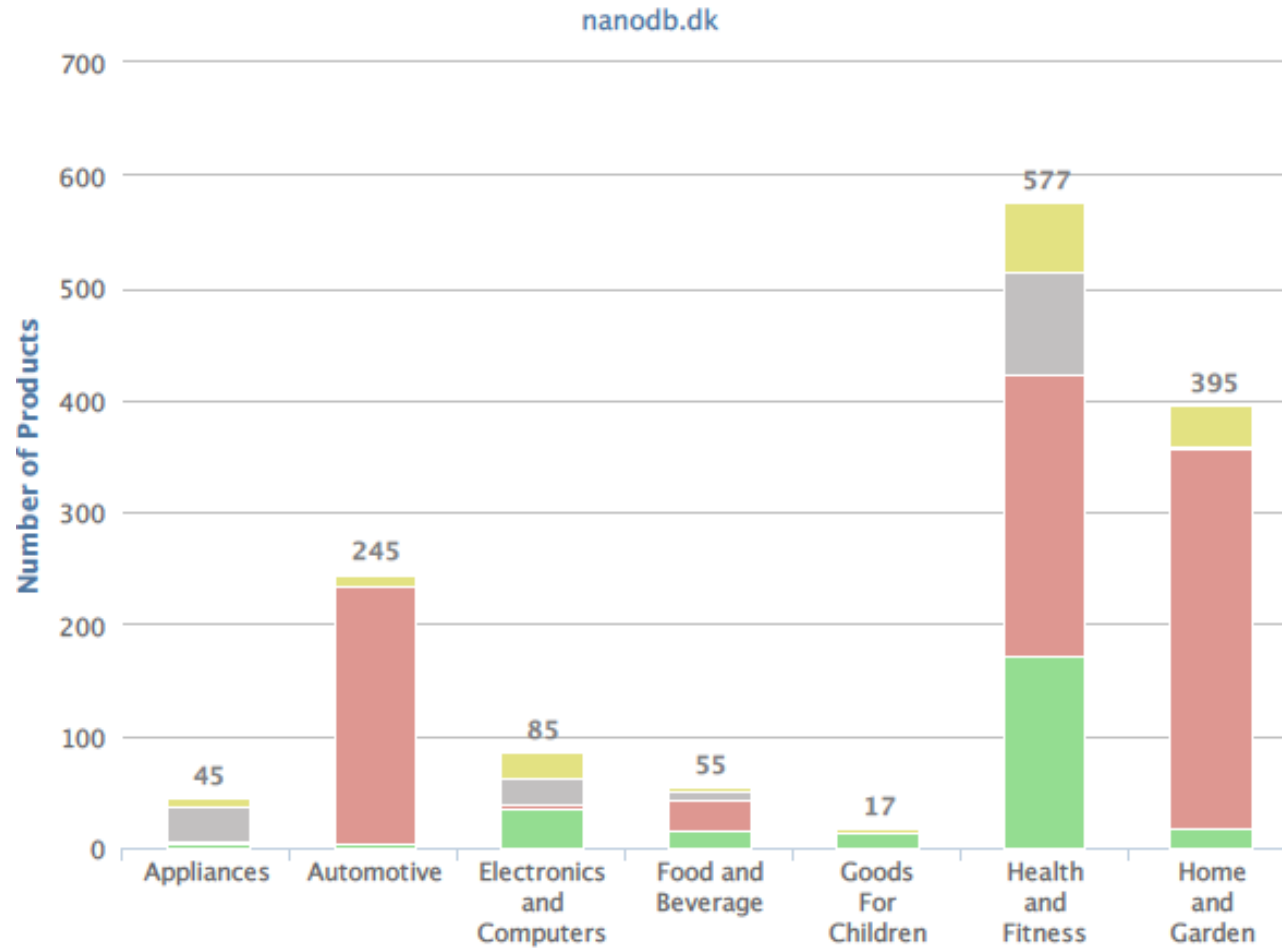
Human effects

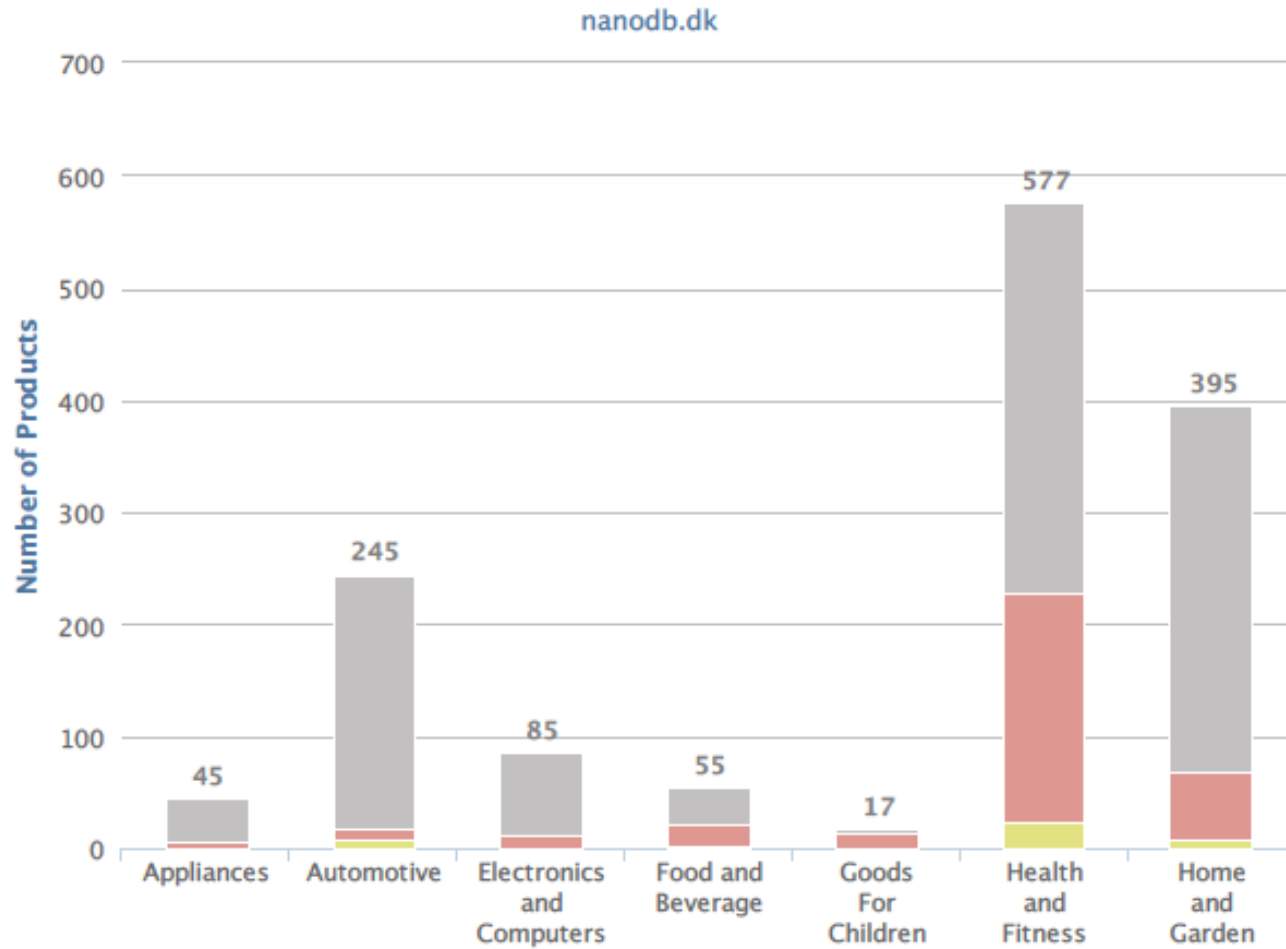


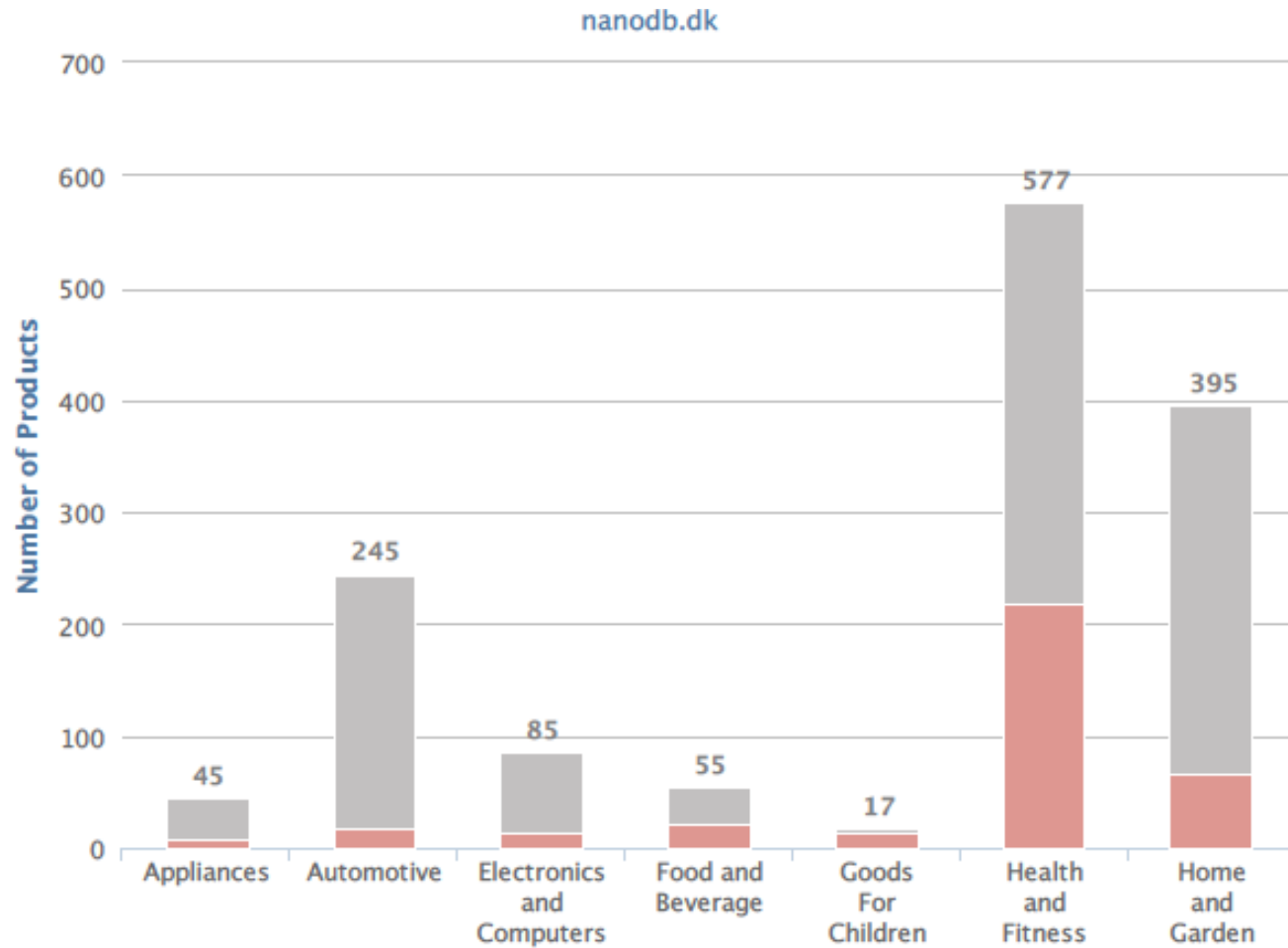
Environmental effects











Do Your Own Analysis!



Limitations

- Based on "nano-claims"
 - Yes, but we cannot at this point do independent validation
- Products are "all red"
 - Could seem so, but they turn red for different reasons (HARN vs. CMRs)
- Crude hazard assessment
 - What do you mean?
- Crude exposure assessment
 - Yes, but the producers do not provide information that would enable more detailed exposure assessment

Funding

● Thx 4 €

- DK EPA (2010-2011)
- Villum Foundation (2012-2014)
- EnvNANO (2013-2015)
- SUN (2014-2015)

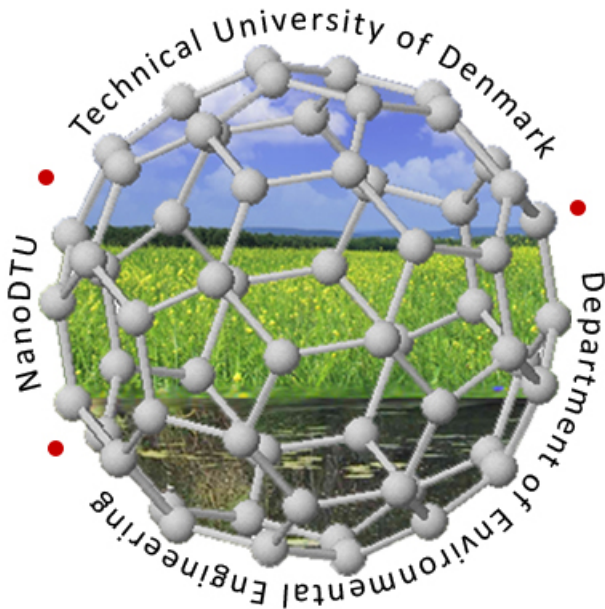


This work is part of the project ENVNANO (Environmental Effects and Risk Evaluation of Engineered Nanoparticles) supported by the European Research Council (grant no. 281579).

This project has received funding from the European Union's Seventh Framework Programme [FP7/2007-2013] under EC-GA No. 604305 'SUN'



Thank you for your Attention!



? 'sfh@env.dtu.dk