Professional Guidelines for establishing an Open Nano Lab / a Nano Researcher Live area

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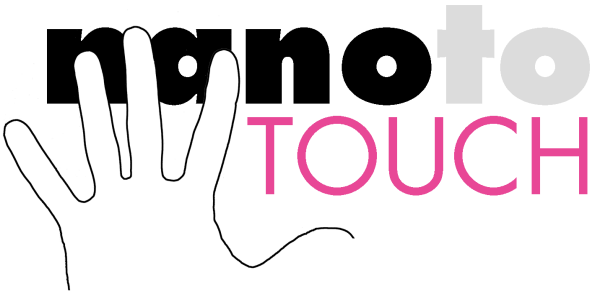

Appendix:

List of Nanoproducts

This handbook and its appendices present professional guidelines on how to establish an Open Nano Lab or a Nano Researcher Live area in a science museum / science centre in cooperation with a local partner university.

Of course the construction of such areas requires individual planning depending on the local circumstances, and thus this work can not be seen as a complete set of instructions, but far more as a guidance manual containing the experiences gathered in the 'Open Research Laboratory' of the Deutsches Museum in a condensed form.

SEVENTH FRAMEWORK PROGRAMME

Prepared at the Deutsches Museum, Munich, Germany
in the scope of the 7th Framework Programme project

nanotoTOUCH
nanosciences live in science centres and museums

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(vers. 2 - 08.2009)

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This Appendix

Nanotechnology is already present in many different areas of our lives. The extensive spectrum ranges from applications such as self-cleaning exterior paint and dirt-repellent clothing to hard disk drives and antibacterial computer keyboards. This Appendix 'List of Nanoproducts' gives an overview of various product examples in which nanotechnology is already incorporated along with corresponding texts. Feel free to use these texts in your exhibition.

The manifold applications of nanotechnology, in particular, offer an enormous potential for growth. The worldwide turnover is estimated to increase to 1,8 trillion Euros. This represents a more than tenfold increase compared to today (Lux Research estimate).

The prefix “nano” enjoys great popularity in the field of marketing, as the phrase implies high innovation potential and progress. However, this unfortunately also leads to a number of products being advertised with the term “nano” where the nanotechnology component is questionable or even non-existent (even some of the products listed in this appendix are debatable in this context). This is both an important and an interesting point to note when presenting and discussing such products in public.

Automotive

In the automotive field there is a growing demand for nanotechnology products due to their high performance and efficiency. Thus, it is expected that this sector will grow strongly and have a significant impact on all areas of the automotive industry, from safety to efficiency, accessories to emissions.

AEZ Raver NANO TEC

Product description:
alloy wheel

Manufacturer:
AEZ Leichtmetallräder GmbH

Text: The alloy wheel is equipped with a hydrophobic surface coating. Adhering dirt is easily washed away by rain water. Additionally, the coating increases scratch and heat resistance.

BORPower S-250

Product description:
motor oil additive

Manufacturer:
NNT Nanotechnology AG

Text: After diamond, the element boron is the second hardest material known. The company NNT produces extremely hard nano-particles based on boron carbide, having a diamond-like crystal structure. These crystals about 4-5 nanometer in size form a hard anti-friction coating inside the motor. Additionally the oil solved nano-particles cause a friction reduction by rolling between surfaces.

ERC Nano 10^{-9}

Product description:
motor oil additive

Manufacturer:
ERC GmbH

Text: The additive builds a thin film of nano structures on friction surfaces inside the motor. This reduces friction and thus also fuel consumption.

Mercedes-Benz nano-particle clearcoat

Product description:
scratch-resistant automotive paint

Manufacturer:
BASF AG

Text: By adding silicon dioxide nano-particles and increasing the crosslinking within the paint a much higher scratch resistance is achieved.

Nigrin NanoTec Series

Product description:
car care products containing nanotech

Manufacturer:
Inter-Union Technohandel GmbH

Text: The NanoTec polish contains nano-sized wax particles that make it easy to polish out and subsequently leave a water repellent surface structure on the paint. The NanoTec glass cleaner contains silicon dioxide nano-particles which fill small scratches in the windscreen and thus giving a clearer view.

Sonax ProfiLine Series

Product description:
car care products containing nanotech

Manufacturer:
Sonax GmbH & Co KG

Text: The ProfiLine Nano Polish contains mineral micro-particles which decompose to nano-particles during polishing, allowing for a high gloss shine in one pass.
The ProfiLine Nano Lack Protect paint sealing contains reactive nano-particles that interconnect with the paint to build a hard, long-lasting protection layer.

Construction

The construction business has and increasingly will benefit from nanotechnology. Concrete is stronger and more durable, steel is tougher and glass has scratch-proof or self-cleaning properties. It is expected that increased strength and durability will help reduce the environmental footprint of the construction industry by increasing the efficient use of resources, e.g. by reducing pollution in production of materials or by advancements in insulation. Improving surfaces with easy-to-clean coatings can have a huge economic impact. Simply by implementing silicondioxide nanocoatings, maintenance and cleaning costs are estimated to be reduced by 40%.

Duravit 2nd Floor WonderGliss

Product description:
washbasin with dirt repellent surface

Manufacturer:
Duravit AG

Text: WonderGliss is a hydrophobic coating burnt into the ceramic surface.Water rolls off the surface, dirt is easily washed away (easy-to-clean surface).

Erlus Lotus

Product description:
roof tile with lotus effect

Manufacturer:
Erlus AG

Text: Two combined effects give the tile self-cleaning properties: Titaniumdioxide particles burnt into the surface of the tile cause organic compounds to decompose when activated by the ultraviolet portion of sunlight (photocatalytic effect). Additionally, the tile surface has a microscopically rough surface (lotus effect). This reduces the adherence of dirt particles which are then easily washed away by rain.

Herbol Symbiotec

Product description:
exterior paint

Manufacturer:
Akzo Nobel Deco GmbH

Text: When applied, the paint generates a three-dimensional network of inorganic nano-particles and a polymer matrix (BASF Col9) on the facade.
This makes the surface extremely hard and hydrophilic.
Water droplets spread out on the surface,
causing the wall to dry much faster.

Kludi-Mix touch free

Product description:
tap with anti-fingerprint surface

Manufacturer:
Kludi GmbH & Co. KG

Text: The matt-chrome fitting is coated with a thin glass-like layer with embedded nano particles. This results in a microscopically rough surface that repels fingerprints and dirt.

PCI Nanolight

Product description:
tile adhesive

Manufacturer:
PCI Augsburg GmbH

Text: Crystal structures in the nanometer range grow inside the cement matrix during hardening. By using a specific formula this process can be influenced to improve product characteristics.

Sto Lotusan

Product description:
exterior paint

Manufacturer:
Sto AG

Text: By painting a facade with Lotusan a special surface structure is applied. Just like with a lotus leaf, the contact area for water and dirt particles is drastically reduced by a combined micro and nano structure. Dirt particles cannot adhere and are easily washed away by raindrops.

Cosmetics

Due to their potential to penetrate unusually deeply into skin, organs, teeth etc., nanoparticles are of extreme interest to the cosmetic industry. However, the health and toxicity impacts of nanomaterials in cosmetics and sunscreens remain largely unknown, with long-term studies only recently having begun. Yet the cosmetics industry is currently on the forefront of incorporating inadequately tested technology into products for personal care, sometimes without any indication of the 'nano' contents.

This approach is strongly critisized by various organisations, who are demanding regulatory laws for the use of nanoparticles in cosmetics. By exhibiting such products it is possible to encourage an open debate with museum visitors on the potential benefits and risks as well as the ethical concerns that this field engenders.

Miradent Nanosensitive hca

Product description:
toothpaste with nanoparticles

Manufacturer:
Hager & Werken GmbH

Text: This tooth paste contains special particles that bond to the tooth surface and release sodium, calcium and phosphorus ions over a period of up to seven days. This leads to a remineralization of the tooth surface. The ions form a layer of hydroxyl-apatite at exposed tooth necks, closing dentinal tubules and thus reducing hypersensitivity.

Nivea Pure Invisible / Energy Fresh / Basis pH

Product description:
deodorant with active ingredients in a nano emulsion

Manufacturer:
Beiersdorf AG

Text: A new production method enables the creation of emulsions of nanometer sized oil droplets in water, thus negating the need for alcohol a solvent in deodorants. The solution appears transparent, as the oil droplets are smaller than the wavelength of visible light. The active ingredients in the nano droplets can penetrate the skin easily; the addition of preservatives is unnecessary.

Nivea Sun LSF 20

Product description:
sun lotion with titanium dioxide particles

Manufacturer:
Beiersdorf AG

Text: To filter cancerogenic ultraviolet light from the sunlight, more and more zinc or titanium dioxide nanoparticles are used. Compared to conventional sun creams based on organic molecules, these have a much better filtering effect and a diminished allergic potential.

Sangui Pure Moisture

Product description:
nano emulsion to stimulate skin metabolism

Manufacturer:
SanguiBioTech GmbH

Text: The various active ingredients are dissolved in a nano emulsion. This fine dispersion enables the ingredients to penetrate the skin more easily and thus have a more profound effect on skin regeneration.

Theramed S.O.S. Sensitiv

Product description:
toothpaste with nanoparticles

Manufacturer:
Schwarzkopf & Henkel GmbH

Text: The toothpaste contains nanometer-sized particles of hydroxylapatite. These attach themselves to exposed tooth necks, thus creating a bio-analogue protection layer. This seals the dentinal tubules, preventing the transmission of external stimuli to the nerves in the inner tooth.

Domestic

The most prominent domestic applications of nanotechnology are self-cleaning surfaces on ceramics or glasses, or anti-stick coatings on cooking utensils. However, with the emergence of further nanotechnological innovations, it is possible that our households will significantly change in the foreseeable future. As everyone lives somewhere, developments in this field should potentially interest people from all walks of life.

Biff Fresh Shower

Product description:
bathroom cleaner

Manufacturer:
Henkel KGaA

Text: The nano-protect formula of the bathroom cleaner creates an invisible protection film on the covered areas. Water runs off more quickly and evenly, reducing the formation of lime scale and soap stains.

Deichmann Nano Nässeblocker

Product description:
waterproofing for textiles

Manufacturer:
Deichmann-Schuhe GmbH

Text: Nano-particles form a thin network on the textile surface. Hydrophobic components arrange into a protective layer, causing dirt and fluids to be repelled.

Emsal Laminat

Product description:
floor care with humidity protection

Manufacturer:
Werner & Mertz GmbH

Text: The NANOtec formula creates a hydrophobic coating at the gaps and edges of laminate floors.Water is prevented from penetrating into the gaps, thus precluding any swelling of the floor.

Gastrolux Cast Frying Pan Biotan

Product description:
frying pan with non-stick surface

Manufacturer:
Gastrolux GmbH

Text: The non-stick surface of the frying pan is a hybrid system: mineral nano-particles are enclosed in a classic “weak” non-stick coating, increasing scratch resistance.
These nano-particles generate a slight surface roughness – similar to that of a lotus leaf – that also generates non-stick properties.

Melitta Toppits Fix-Brat Alu

Product description:
aluminium foil with black coating

Manufacturer:
Beiersdorf AG

Text: The Fix-Brat foil is coated with a black film on the outside which increases heat absorption, thus reducing cooking time by up to 30%. The coating consists of an inorganic nanocomposite material which adheres particularly well to aluminium and is stable to temperatures of up to 500°C.

Miele Fettpfanne PerfectClean

Product description:
baking tray with non-stick surface

Manufacturer:
Miele & Cie. KG

Text: Miele coats the inside surfaces and baking trays of their ovens with a nanotechnology-based enamel coating. Due to a finely structured surface, fat and cake mixtures are not able to stick to the surface. The coating is heat-proof, cut-resistant and durable.

Nanopool Cork

Product description:
corks preventing cork taint

Manufacturer:
Nanopool GmbH

Text: The loss of wine spoiled by cork taint in Europe is estimated at 500Million Euro per annum. The chief cause is 2,4,6-Trichloroanisole produced by moulds in the cork. Nanopool prevents the substance from leaking by covering the cork with an ultra-thin glass layer. The breathability of the natural cork remains.

Nanopool Faser / Stone / Kunststoff / Glass&Ceramic protect

Product description:
surface refinement for different substrates

Manufacturer:
Nanopool GmbH

Text: A sub-100 nm thin glass layer applied to different materials enhances the surface properties significantly. Thus, the coating repels water while at the same time remaining breathable. The adherence of dirt and germs to the surface is reduced.

Remington S9000 professional

Product description:
hair straightener with nano-diamond coating

Manufacturer:
Rayovac Europe Ltd.

Text: The styling plates of the hair straightener have a combined ceramic, nano-diamond and Teflon surface coating. This special multilayer structure renders the plates extremely abrasion proof and very smooth. Additionally it ensures an even heat distribution over the whole surface.

Rowenta Advancer DZ 9020 R

Product description:
flat iron with nano-glass-soleplate

Manufacturer:
Beiersdorf AG

Text: The high-grade steel soleplate of the iron is coated with a glass surface a few nanometers thick. This not only enables a smoother glide over the textile surface, but also renders the soleplate scratch resistant and hinders heat-caused tarnishing of the steel. A further special feature is that it is possible to reshape the soleplate after annealing with the vitreous-ceramic surface coating without damage.

Wilkinson Protector 3D Quattro Titanium

Product description:
razor blades with nano-diamond coating

Manufacturer:
Wilkinson Sword GmbH

Text: The blades are coated with a thin layer of polycrystalline diamond, significantly reducing wear. The diamond coatings are deposited from the gas phase in a special reactor. The resulting diamond crystals are between several ten to hundred nanometers in size.

Electronics

Current high-technology production processes in electronics are based on traditional top down strategies, with various structures achieving nano-dimensions, e.g. regarding the gate length of transistors in CPUs or DRAM devices. However, at some point this approach will no longer be viable and will fail to produce further advances in this field. Instead, a bottom-up approach will be required, with nanotechnology becoming absolutely essential to the electronics industry.

Apple iPod Nano 2GB

Product description:
MP3 player

Manufacturer:
Apple Inc.

Text: To store constantly increasing amounts of data on ever smaller devices the structural size of microchips is continuously decreasing. All current memory and microprocessor chips have structure sizes below 100 nm; the flash memory installed in this iPod Nano has a structure size of about 90 nm.

DeWalt DC234

Product description:
hammer drill with nano-phosphate Li-Ion battery

Manufacturer:
DEWALT, Inc.

Text: The new nano-phosphate technology was first used in 2005 in DeWalt powertools. DeWalt, the professional brand of Black&Decker, supported the start-up company A123Systems in an early stage of the cell development. The big advantages of these battery-operated hand tools are the high number of possible charging cycles (~2000), and the reduced weight compared to conventional Li-Ion batteries.

Hitachi Microdrive 3K4 4GB /
DK23AA-12 12GB

Product description:
hard disk drives with GMR-technology

Manufacturer:
Hitachi Ltd.

Text: The discovery of the quantum mechanical GMR effect (giant magnetoresistance) enabled a great step forward in the development of miniaturized hard disk drives. Within a suitable layer a marginal change of an external magnetic field induces a huge change of the electric resistance. This enables the production of highly sensitive magnetic sensors used in all modern hard disk drives.

Nanophosphate lithium ion battery

Product description:
Lithium-ion battery with nano-phosphate electrode coating

Manufacturer:
A123Systems, Inc.

Text: The positive electrodes of these rechargeable batteries consist of nanometer-sized Lithium-Phosphate crystals which increase the electrical conductivity of the material. This results in a significantly shorter charging time (5 to 10 min vs. 90 min for conventional cells) and a reduced wear of the electrode material (~2000 charging cycles vs. 600-800 for conventional cells).

RNT Nanofoil

Product description:
highly reactive metal foil

Manufacturer:
Reactive NanoTechnologies Inc.

Text: This highly reactive foil consists of several hundred layers of aluminium and nickel (20 to 80 nm thick). When external energy is applied, the layers react with each other, creating localised temperatures up to 2000°C for a very short time. Thus, this foil is particularly suited for joining different materials by brazing (metal, ceramics), for instance for mounting high-power light emitting diodes on heat sinks.

Rockwood Nanofil

Product description:
electric cable with fire resistant insulation

Manufacturer:
Kabelwerk Eupen AG

Text: Natural layered silicates of nanometer size provide – after a chemical modification – an increased fire resistance of the wire's plastic mantle.
In a fire a non-flammable crust forms, preventing the dripping of molten plastic and thus inhibiting the spreading of the fire.

Glass

Gold ruby glass was arguably the first man-made product incorporating nanotechnology. Consisting of nano-sized gold particles evenly spread within the glass, blue and green light is absorbed by the particles, thus creating the bright red color. Although ruby glass was well known for many centuries, the effect was first explained byNobel Laureate Richard Zsigmondy at the end of the 19th century. First mentioned in 14th century Italian texts on the fabrication of church windows, the production of gold ruby glass was improved by Johann Kunckel around 1680.

Today, glass products are improved by nanotech coatings, e.g. rendering lenses scratch-resistant or self-cleaning. These surface coatings are already in widespread use.

Boraglas

Product description:
glass marking with silver nano-particles

Manufacturer:
Boraglas GmbH

Text: Silver nano-particles are inserted into a glass substrate using a laser (diffusion). The particles are completely enclosed by glass, and thus are both scratch- and corrosionproof.
The technology is used as a tamper-proof method for explicitly marking various glass materials.

Essilor Crizal ALIZÉ

Product description:
eyeglass lenses with multifunctional coating

Manufacturer:
Essilor GmbH

Text: The lenses are coated with a nanocomposite laquer applied in an immersion process to improve the scratch resistance. Subsequently a thin layer of perfluoride polymers is applied to create a hydrophobic surface which is significantly less susceptible to defilement.

Nachtmann Longdrink Tumbler SKIN

Product description:
staining glass with nano particles

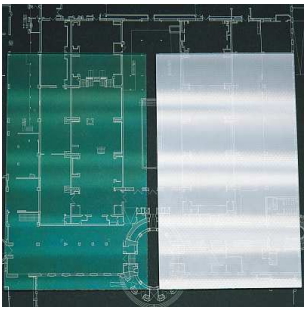
Manufacturer:
Nachtmann GmbH

Text: The tumbler is produced by the cased crystal method. A bubble of clear glass is blown into a hemisphere of colored glass and then molten together. The patterns are then cut into the colored glass so that the clear glass reappears. The tumbler on the left is made of real gold ruby glass. The color of the tumbler on the right is caused of 100 nm sized silver particles enclosed in the glass.

Schott CONTURAN

Product description:
glass with antireflection coating

Manufacturer:
Schott AG



Text: The raw glass is dip-coated on both sides with three layers each of silicon dioxide and titanium dioxide. The individual layers are between 50 nm and 100 nm thick and are annealed to increase adhesion. Antireflective glass is used, for example, for high-quality picture frames or train service indicators.

Steiner Nighthunter XP 8 x 56

Product description:
*b*inoculars with nano protection

Manufacturer:
Steiner-Optik GmbH

Text: The lenses are coated with an ultra-thin hydrophobic layer. This layer not only offers additional protection in harsh environments (oil, acid, salt water), but also displays a microscopic roughness, enabling dirt to be easily washed off by water.

Uvex Sonic RS 747

Product description:
helmet visor with multiple coatings

Manufacturer:
UVEX SPORTS GmbH & Co. KG

Text: The visor made of Makrolon is coated on the outside with a scratch-resistant layer of silicon dioxide nanoparticles. This layer also renders the surface hydrophobic, enabling water droplets to run off easily. On the inside the visor is coated with a hydrophilic layer based on poly-siloxane. This ensures a fine distribution of any water droplets on the surface, thus hindering fogging of the visor.

Uvex Apache Super Pro

Product description:
ski goggles with multiple functional coatings

Manufacturer:
UVEX SPORTS GmbH & Co. KG

Text: The glass of the goggles is coated with a scratch-resistant layer of silicon dioxide nano-particles on the outside. This layer also renders the surface hydrophobic, enabling water droplets to run off easily. On the inside the goggles are coated with a hydrophilic layer based on poly-siloxane. This ensures a fine distribution of any water droplets on the surface, thus hindering fogging of the goggles.

Zeiss LotuTec

Product description:
eyeglass lenses with dirt and water repellent surface coating

Manufacturer:
Carl Zeiss AG

Text: The hard coating of the LotuTec-lenses is reinforced by incorporating nano-particles, increasing their mechanical and chemical resistance. The nano-particle coating renders the glass surface water, dirt, and oil repellent.

Medicine

The impact of nanotechnology in medicine is rapidly growing and is expected to bring significant and revolutionary advances to medical diagnosis and treatment. The field of nanomedicine is generally recognised to encompass diagnostics, medical devices, drug discovery and delivery, and regenerative medicine. It is clearly a complex field and thus needs to be addressed and discussed in public in order to optimise benefits and limit risks.

Despite its promise of providing medical progress, nanomedicine has a cost for society because of its potential to change medical procedures. For example, early diagnosis will shift medical treatment from curing acute diseases to early screening for diseases up to prevention of diseases. This will have a major impact on the health insurance system, the pharmaceutical and medical equipment economy and social and ethical questions down to the question of what will be called illness. In addition, a call for regulation and control is becoming more and more pronounced in society.

An exhibition of currently available nanomedical products is an excellent base for a public discussion on these ethical, societal and legal questions, as well as giving an outlook on the future of medicine.

Magnetofluid MFL AS M01

Product description:
Magnetofluid for cancer therapy

Manufacturer:
Magforce Nanotechnologies AG

Text: The magnetofluid consists of 15 nm sized iron oxide particles dissolved in water. The fluid is directly injected into the tumor tissue. Excited by an external magnetic field the particles produce heat, thus damaging the tumor tissue.With this technology tumors can be combatted from inside the body.

Ostim 35

Product description:
Injectable bone matrix

Manufacturer:
aap Implantate AG

Text: The main component of this synthetically produced bone substitution are hydroxylapatite nano-particles, the basic building material of bones. To fill voids caused by traumata or disease the substitute is injected. During the healing of the bone the material decomposes and is subsequently substituted by natural bone.

Resovist 0,5 mmol Fe/ml Injektionslösung

Product description:
Liver-specific contrast agent

Manufacturer:
Schering Deutschland GmbH

Text: Resovist is a contrast agent based on iron oxide particles for magnetic resonance tomography analysis. It is injected intravenously and enables a reliable diagnostic of liver tumors even in an early stage. The iron oxide nanoparticles have a diameter of about 60 nm.

Siemens Centra

Product description:
Hearing aid with hydrophobic coating

Manufacturer:
Siemens Audiologische Technik GmbH

Text: The surface is coated with an extremely smooth hydrophobic
layer. This reduces the adherence of sweat, grease and dirt on the surface, thus ensuring easier cleaning. Additionally, the reliability is increased, as liquids are not able to penetrate the housing due to a significantly reduced capillary effect.

Nanosilver

Since ancient times the noble metal silver was said to have protective properties. Yet with the triumph of antibiotics over pathogenic bacteria, silver sank into oblivion. Lately, however, an increasing resistance of many pathogens to antibiotics has revitalised the use of silver in infection prophylaxis.

Silver protects against a wide range of different bacteria, fungi, and other pathogens. The ions emitted from the silver disrupt vital functions of the micro-organisms. This effect is mainly based on three mechanisms:

- blocking of enzymes, preventing vital cellular transport functions
- reduction of the structural stability of the cell
- damaging of the membrane structure

By integrating nanosilver particles, common materials aquire these protective properties without affecting their mechanical properties. The particles act as reservoirs which then dispense silver ions continuously over the complete product life cycle. Today, silver nano particles are widely applied. Apart from the exhibits shown here, nano-silver based antibacterial surface coating are applied to great variety of products, from washing machines and fridges to surgical instruments, catheters and stents.

Antibacterial Microfibre Cloth

Product description:
antibacterial microfibre cloth

Manufacturer:
East-West-Gevelsberg Ltd.

Text: Silver nano-particles are molten into the fibers during the production process, anchoring them permanently. This process ensures that the anti-bacterial effect remains unchanged even after many washing cycles.

Bioni Nature

Product description:
mould-resistant interior paint

Manufacturer:
Bioni CS GmbH

Text: This interior paint contains silver nano-particles about 10 nm in size. This makes the paint anti-bacterial and kills molds effectively. In comparison with conventional chemical-based biocides, no health risks are to be expected from the ingredients of the nano-silver paint. Aditionally, the effect remains stabile over longer periods of time.

Lenscare Nano-Behälter

Product description:
container for contact lenses

Manufacturer:
LensCare AG

Text: Silver nano-particles are embedded in the plastic of the container, releasing silver ions when in contact with fluids. This disrupts the metabolism of bacteria and thus reduces germs in the contact lens fluid.

Nano-Kuschel

Product description:
fabric softener

Manufacturer:
NanoSys GmbH

The properties of Nano-Kuschel are based on two different kinds of nano-particles: silver nano-particles have a disinfectant effect, while silicon dioxide particles with a hydrophilic coating attach to the fibers and make the fabric more absorbent.

Samsung R60 (casing)

Product description:
notebook with antibacterial coating

Manufacturer:
Samsung Electronics Co. Ltd.

Text: Computer keyboards and mice are well known bacterial hotbeds. To reduce the number of germs in this area, the keyboard and palm rest of the Samsung R60 notebook are equipped with a nano-silver coating.

(no name)

Product description:
anti-bacterial plastic food container

Manufacturer:
unknown, China

Text: The plastic of the box in the front has incorporated silver nano-particles. In contact with humidity these produce silver ions which have an anti-bacterial effect. Thus, food stored in this box stay fresh longer than in a conventional plastic box.

Recreation, Sports, Textiles

In the field of recreation and sports the use of nanotechnology can be generally allocated to the fields of functional clothing and composite materials using carbon nanotubes. Given below are descriptions of these two applications with a short list of examples. After this are a further number of textile and sports products with descriptions.

Composite materials with carbon nanotubes - Carbon nanotubes (CNT) are microscopical tubular structures made of carbon. These have a diameter of 1-50 nm and can be up to several millimeters long. Carbon Nanotubes have outstanding properties: having the same volume their weight is only one sixth of that of steel, with a tensile strength 30 times higher. The electric conductance is roughly 1000 times larger than that of copper wire. These excellent properties are used in the aerospace industry as well as in high-performance sports. By chemically cross linking carbon nanotubes in a carbon fiber matrix stiffness and impact strength can be significantly increased.This method increases the impact strength in the shown hockey stick by 60-70%.

BMC Racing TeamElite01

Product description:
mountain bike frame (seat stays)

Manufacturer:
BMC AG

Montreal Nitro Lite

Product description:
hockey stick made of nano-composite material

Manufacturer:
Montreal Sports Oy

Babolat VS NTC DRIVE

Product description:
CNT-enhanced fiber material tennis racket

Manufacturer:
Babolat

Atomic IZOR 7.5 / 9

Product description:
alpine ski with nanoframe technology

Manufacturer:
Atomic Austria GmbH

C.A.M.P Corsa Nanotech

Product description:
ice axe with pick made of Sandvik Nanoflex steel

Manufacturer:
C.A.M.P SPA

Functional clothing - Nanotechnology is most commonly used to functionalise clothing, making it dirt and water repellent. Based on the self cleaning mechanisms of different plants, e.g. the lotus flower, a microscopically rough surface prevents the attachment of dirt particles which are easily washed away by water. Presently there are two large fabric manufacturers for functional clothing. Both follow slightly different strategies for the functionalization of the fabric. The American company Nano-Tex (nano-pel) modifies the fiber structure on a molecular level. This results in a microscopically rough surface. The Swiss manufacturer Schoeller (NanoSphere) impregnates the fabric with an extremely long-lasting matrix of inorganic nano-particles. These create the rough layer on the surface.

Elements Nano-Tex Jacket

Product description:
Trekking jacket and trousers made of

Manufacturer:
Jack Wolfskin GmbH & Co. KGaA

Mammut Eclipse Soft Shell LC XCR

Product description:
Gloves made of NanoSphere fabric

Manufacturer:
Mammut Sports Group AG

Odin

Product description:
shirt made of Nano-Dry fibers

Manufacturer:
Mammut Sports Group AG

Victorinox Tourbach

Product description:
traveling bag made of NanoSphere fabric

Manufacturer:
Victorinox AG

FARE Nanobrella Exclusive

Product description:
umbrella with nano-pel coating

Manufacturer:
Fare - Guenther Fassbender GmbH

Asics Gel Tech Walker 7 WR

Product description:
Running shoes with dirt repelling surface

Manufacturer:
Asics Corp.

Oakley Nanowire 3.0 Polarized

Product description:
Sunglasses with hydrophobic coating

Manufacturer:
Oakley Inc.

BASF MINCOR TX TT

Product description:
fabric for awnings with self-cleaning surface

Manufacturer:
BASF AG

Text: The fabric displays a microscopically rough surface. The roughness is created by nano-particles embedded in a matrix. Fluorocarbons attached to the surface additionally increase the hydrophobic effect.

Greenyarn

Product description:
socks and fabrics functionalized with bamboo charcoal

Manufacturer:
Greenyarn LLC

Text: Greenyarn “eco-fabrics” contain bamboo charcoal nano-particles interwoven into the fibers. These give the fabrics anti-bacterial and anti-fungal properties. Also, the porous structure of the charcoal absorbs humidity, and molecules inducing body-odour are decomposed. The fabrics are washable over 50 times without diminishing the effects.

Nano-Allzweck-Schürze

Product description:
stain resistant apron

Manufacturer:
Pro-Idee GmbH & Co. KG

Text: The fibers of the fabric of this apron are functionalized with a microscopically rough surface coating. This makes the material hydro- and oleophobic. Red wine, fat and gravy splatters simply run off.

Olymp Krawatte rot 8605/00/37

Product description:
stain resistant neck-tie

Manufacturer:
Olymp Bezner GmbH & Co. KG

Text: The silk fabric of the tie is equipped with a stain resistant nano-coating. Coffee, red wine or gravy cannot penetrate the fibers and thus leave no stains.

Eddie Bauer Khaki Nano-Care

Product description:
first item of clothing with nano-protection

Manufacturer:
Eddie Bauer

Text: The first explicitly advertised application of nanotechnology in clothing were these khaki trousers, introduced by the US company Eddie Bauer.
The cotton is coated with a dirt and water repellant surface by Nano-Tex.

Holmenkol LubeExtreme

Product description:
slip sealant

Manufacturer:
Holmenkol GmbH

Text: LubeExtreme is a nano slip-sealing for all movable metal parts such as chains, hinges and gears. The metal parts are coated with a thin slip film, which is also dirt repellant due to additionally added nano-particles.

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