non-technical & easy to understand

FREQUENTLY ASKED QUESTIONS ABOUT NANO COATINGS

and the incredible world of surface protection

13

SIMPLE QUESTIONS WE ALWAYS GET ASKED

ANSWERED IN SIMPLE NON-TECHNICAL ENGLISH - PRACTICAL AND USABLE

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WHAT'S "NANO" ACTUALLY?

NANO

/næn.oʊ-/
origin latin for: "**dwarf**"

One billionth of a stated unit.
Here: E.g.: 0.000,000,001 of a meter - That's it!

WHAT'S "NANOTECH"?

Nanotechnology is the manipulation and engineering of materials on a molecular and atomic (1-100 nanometer or nm) scale. It was first proposed by physicist **Richard Feynman in his famous 1959 lecture "There's Plenty of Room at the Bottom,"** in which he discussed the possibility of manipulating and arranging individual atoms and molecules to create new materials and devices.

The development of the scanning tunnelling microscope in 1981 and the atomic force microscope in 1986 enabled scientists to directly manipulate and image individual atoms and molecules, which helped to pave the way for the growth of nanotechnology as a field.

Some of the key achievements of nanotechnology include the creation of new materials with unique optical, electrical, and magnetic properties; the development of new medical diagnostic and treatment methods, such as targeted drug delivery and imaging techniques; and the creation of new devices for energy production and storage, such as solar cells, batteries and even photosynthesis.

The outlook for nanotechnology is very positive, some placing it into the Top 10 of the most promising technologies that will shape our future, as it has the potential to revolutionise a wide range of industries, from medicine and electronics to energy and materials science.

Researchers are working on developing new methods for synthesising and manipulating nanomaterials, as well as improving our understanding of the unique properties of materials at the nanoscale.

Here are a few examples of specific applications and areas of research in the field of nanotechnology:

- **Medicine**: Researchers are developing new diagnostic methods, such as biosensors and imaging techniques, as well as new therapeutic methods, such as targeted drug delivery and gene therapy. Nanoparticles can also be used for medical imaging and for sensing biological molecules.

- **Electronics**: Nanotechnology is being used to develop new types of transistors, data storage devices, and other electronic components that are smaller, faster, and more energy-efficient than current technologies. Researchers are also exploring the use of carbon nanotubes and graphene in electronics.

- **Energy**: Scientists are working on developing new methods for producing and storing energy, such as solar cells and batteries that use nanomaterials. These devices can have improved performance and efficiency compared to conventional technologies.

- **Materials** science: Researchers are using nanotechnology to create new materials with unique properties, such as self-cleaning surfaces, improved strength and toughness, and new optical and electronic properties. Applications include textiles, catalysts and coatings.

- **Environmental Science**: One of the most promising application of nanotechnology is its ability to help address environmental problems. Researchers are investigating the use of nanomaterials in areas such as water treatment, air purification, and contaminant remediation.

- **Biotechnology**: Researchers are using nanotechnology to develop new tools for understanding and manipulating biological systems at the cellular and molecular level. Applications include the development of new drug delivery systems, diagnostic techniques, and biosensors.

- **Cosmetics**: cosmetics industry is extensively using the nanoparticles for its products such as sunscreens, anti-aging creams and makeup products, these tiny particles can be used to deliver active ingredients in a more targeted and effective way, resulting in improved product performance.

- **Agriculture**: Nanotechnology is being used to develop new methods for improving crop yields and food quality, as well as new methods for pest control and soil management. Nanoparticles can be used as a carrier for fertilizer, pesticides, and other essential agricultural inputs, allowing for more efficient and targeted delivery.

- **Water treatment**: Researchers are using nanotechnology to develop new methods for removing impurities from water, such as heavy metals and pollutants. By using nanoparticles, researchers can create new types of filters and adsorbents that can more effectively remove impurities from water.

- **Defence**: Nanotechnology is being used in the military/defence industry, for example, to develop new types of lightweight, durable, and stronger materials for use in body armour, protective clothing, and other defence-related equipment.

- **Smart materials**: Researchers are developing new materials that can respond to their environment and have "smart" properties, such as self-healing capabilities and the ability to change shape or form. These materials have potential applications in fields such as robotics, biomedical engineering, and aerospace.

- **Quantum computing**: Research in the field of quantum computing involves the manipulation of individual atoms or molecules to create new types of computing devices that can perform certain types of calculations much faster than current computers. The properties of nanoscale systems make them ideal for this type of research.

- **Optoelectronics**: Nanotechnology is being used to develop new devices that can control the flow of light and electricity, such as LEDs, lasers, and photovoltaics. These devices can be more efficient and have a wider range of applications than current technology.

- **Memory devices**: Researchers are using nanotechnology to develop new types of memory devices, such as non-volatile memories and memories with high storage density. Applications include data storage, biometrics, and internet of things.

- **Environmental monitoring**: Researchers are developing new methods for monitoring the environment using nanotechnology, such as air and water quality sensors, as well as methods for cleaning up environmental contaminants.

- **Advanced manufacturing**: Researchers are using nanotechnology to improve manufacturing processes, such as 3D printing and micro-fabrication. By manipulating materials at the nanoscale, it is possible to create new structures and shapes that are not possible with traditional manufacturing methods.

- **Cybersecurity**: Researchers are developing new methods for securing data and communications using nanotechnology, such as quantum encryption and nanoscale sensors.

- **Automotive**: Nanotechnology is being used to improve the performance and efficiency of automotive parts and systems, such as batteries, fuel cells, and catalysts, etc.

- **Food packaging**: Researchers are developing new packaging materials that can extend the shelf life of food and protect it from contamination using nanotechnology.

- **Therapeutic delivery**: Researchers are using nanotechnology to develop new methods for delivering drugs and therapies to specific cells and tissues in the body.

These are just a few cutting-edge examples of the many ways that nanotechnology is being used to improve various aspects of our lives. This list is not exhaustive.

Research in Nanotechnology continues to produce new often breathtaking discoveries and advancements. The future looks promising with further incredibly exciting developments on the horizon.

WHAT'S "HYDROPHOBIC"?

hydrophobic

/hʌɪdrə(ʊ)ˈfəʊbɪk/
latin: "fear of water"

Hydrophobic is a property of a surface that repels water. Hydrophobic surfaces lack the affinity for water, and tending to repel or not to absorb water. Nature example: **The Lotus Effect, the wings of many insects, and the feathers of many birds.**

How is it used? Surfaces can be manipulated with certain Nanoparticles (NP) such, that water (or anything else you throw at it) simply runs off or can we wiped away without effort. When we coat windows, glass facades, vehicles, car-seats, textiles, solar panels etc. we'd make use of this phenomena.

When a hydrophobic substance gets applied on a surface an invisible layer develops that adheres with the surface on a molecular level that can last for a very long time.

Hydrophobic layers have a strong self-cleaning effect on plastics, heat pipes, metals, textiles, glass, paints, and electronics. Hydrophobic layers improve the anti-freezing behaviour of heat pipes which prevents unwanted build-up and they function as a water and dust protecting coat on electronics.

The presence of this property has a huge potential for products in large variety of industry sectors such as water treatment, heat transfer applications, biomedical devices, and many more.

An extreme version of hydrophobicity is called **super-hydrophobicity** wherein the effect is further amplified.

What's more?

In addition to their ability to repel water and other liquids, hydrophobic surfaces can also have a number of other interesting properties that make them useful in a wide range of applications.

Additional Benefits of Hydrophobic Surfaces:

- **Low Surface Energy**: Hydrophobic surfaces have low surface energy, which means that they do not easily interact with other substances. This is useful for creating non-stick surfaces and reducing friction.
- **Chemical Resistance:** Hydrophobic surfaces can be resistant to a wide range of chemicals, including acids, bases, and solvents. This makes them useful for protecting surfaces from chemical damage.
- **UV Resistance:** Hydrophobic coatings can also have UV resistance which makes them useful for protecting surfaces from UV radiation. This can help to prevent fading and other forms of damage caused by exposure to sunlight.
- **Self-Cleaning:** Dirt and other particles can easily be removed by water droplets or blowing air. This can make them useful for applications where cleaning is difficult, expensive or time-consuming.
- **Durability**: Hydrophobic coatings can be very durable and have a long life-span which makes them useful for applications where the surface is exposed to harsh conditions.
- **Biocompatibility:** Some hydrophobic coatings can be biocompatible, which means that they do not harm living organisms, this makes them useful for medical and pharmaceutical applications.
- **Anti-fouling:** Prevents the buildup of germs on surfaces. This can be useful for an infinite number of use-cases is almost any industry.
- **Anti-bacterial:** Useful for medical applications and surfaces that need to be kept hygienic such as kitchen counters, cutting boards, and other surfaces with infinite applications.
- **Oil-repellent:** Hydrophobic coatings can be tailored to be oil-repellent which can be useful for protecting surfaces from oil spills, this can be useful for marine, oil and gas industries and countless others.

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WHAT'S "HYDROPHILIC"?

hydrophilic

/ˌhʌɪdrə(ʊ)ˈfɪlɪk/
latin: "love for water"

Hydrophilic refers to having a strong affinity for water. Something that is hydrophilic is soluble in water and dissolves into water very easily. Hydrophilic is the opposite of hydrophobic.

A hydrophilic coating increases the wetting on a surface. In applications like "anti-fog", it is often desirable to a have a uniform sheet of liquid. Hydrophilic coatings readily spread water around the object when exposed to moisture, thus enhancing its lubricity and significantly reducing surface friction.

Hydrophilic coatings act like microscopic sponges, gripping the water (or other liquid) to provide low frictional characteristics as long as the surface remains wet. These types of coatings are most notably used in the medical industry for coating medical devices and specifically, surgical tools.

Because these tools regularly come into contact with skin and bodily fluids, minimal friction is crucial. Surfaces coated with hydrophilic coatings exhibit low pulling forces and are able to navigate anatomical pathways while lessening patient discomfort.

The hydrophilic concept is used in many industries. For example, hydrophilic membrane filtration is used in several industries to filter various substances such as Bacteria, Viruses, Particulates, Drugs, Contaminates

Hydrophilic coatings are particularly effective in environments of excessive condensation (visors, mirrors, goggles as the most well-known examples) to major industrial applications, for example, to protect exchangers from the corrosive effect of water.

Hydrophilic coating also exhibits a fine performance in providing protection against water in high temperature and salty environments.

APPLICATIONS:

In medicine, hydrophilic materials are often used in contact lenses, wound dressings, and implants because they are able to absorb and retain water, which helps to keep the tissues moist and promote healing.

In agriculture, hydrophilic polymers can be used as water-absorbing gels to retain water in soil, helping to improve crop yields in arid regions.

In industrial processes, hydrophilic materials are used in a range of applications, such as water purification and oil recovery.

In water purification, hydrophilic membranes can be used to filter out impurities, while in oil recovery, hydrophilic polymers can be used to enhance the recovery of oil from reservoirs.

In the construction industry, hydrophilic coatings can be applied to building materials to make them more resistant to water damage.

In textiles / fabrics, hydrophilic fibres can be used to create fabrics that wick away sweat and moisture from the skin, keeping the wearer cool and dry.

In the field of personal care, hydrophilic ingredients can be used in cosmetics and skin care products to help them better absorb into the skin and provide moisturising benefits.

In the field of food and beverage, Hydrophilic agents are used to thicken and stabilise various food products. They help to prevent separation of components and to maintain the desired consistency of food products.

In the field of pharmaceuticals, Hydrophilic excipients are used in the formulation of tablet, capsules, creams, gels and other dosage forms. They are used to improve the flowability of powders, the wetting and dissolution of tablets, and the bioavailability of drugs.
Etc.

Overall, Hydrophilic applications are diverse, and they have a major impact in many industrial and scientific areas. They have a wide range of uses and can be beneficial in a number of different ways, depending on the specific application.

WHAT'S "OLEOPHOBIC"?

oleophobic

\ olio fō-bik\
latin: "fear of oil/fat"

Oleophobic refers to a substance or surface that has a low affinity for oils and is resistant to oil adhesion or absorption.

Oleophobic materials have a smooth, non-stick surface that repels oil and other liquids. They are commonly used in a wide variety of applications where oil-resistance is important, such as consumer electronics, kitchen appliances, and medical devices.

In general, Oleophobic agents are used on surface treatment of metals, ceramics, plastics, and other materials to make them oil-friendly. They act as a barrier against oil and chemicals, protecting the surface from corrosion, and other types of damage.

Oleophobic and Hydrophobic coatings have a wide range of uses, and they can have a significant impact in many industrial and scientific areas. They can be beneficial in a number of different ways, depending on the specific application.

APPLICATIONS

- **Devices:** One of the most common applications of oleophobic materials is in the creation of coating for touchscreen displays, such as smartphones and tablets, which helps to reduce smudging and fingerprinting.
- **In kitchen appliances**, oleophobic coatings can be applied to prevent oils and greases from sticking to the surface of the cookware, making them easier to clean.
- **In medical industry**, Oleophobic coatings are used on surgical instruments and other medical devices to prevent oil and other substances from adhering to their surfaces.
- **In the aerospace industry,** oleophobic coatings are used on aircraft parts and components to protect against the build-up of oil and other liquids, which can cause corrosion and damage to the aircraft.
- **In the field of sports equipment**, oleophobic coatings are used on sports gear such as balls, gloves, and other equipment to reduce the grip of oil and sweat and provide a better performance.
- **In the field of packaging**, oleophobic coatings are used on packaging materials to prevent oils and other liquids from penetrating the packaging and spoiling the contents.
- **In the field of lab equipment**, oleophobic coatings are used on laboratory glassware and other equipment to prevent oils and other liquids from adhering to the surfaces and making them difficult to clean.
- **In the field of fashion and apparel**, oleophobic coatings are used on fabrics and textiles to repel oil and other liquids, which can be useful in creating stain-resistant clothing and accessories.
- **In the field of optics and optoelectronics**, oleophobic coatings are used on optical surfaces such as lenses and mirrors to repel oil and other liquids, which can improve the performance of the optical device and help to maintain its clarity.
- **In the field of furniture and architecture**, oleophobic coatings are used on surfaces such as countertops, tables, and flooring to resist oil, dirt, and other liquids that can cause discolouration or stains.
- **In the field of recreational products**, oleophobic coatings are used on outdoor gear such as camping and hiking equipment, fishing gear, and hunting equipment to reduce the adhesion of dirt and oil, making them more durable.
- **In the field of personal care**, oleophobic coatings can be used in hair care products, such as hair sprays, gels, and mousses to provide a lightweight, non-greasy finish.

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WHAT'S "OMNIPHOBIC"?

omniphobic

\ omni'fō-bik\
latin: "fear of everything"

An "omniphobic" surface is a surface that repels most liquids and other materials. These surfaces are typically characterised by a high degree of micro- or nano-scale roughness, which creates a lot of air pockets. These air pockets make it difficult for liquids or other materials to adhere to the surface.

Omniphobic surfaces have a number of unique properties, including:

- **Low adhesion**: Liquids and other materials have a difficult time adhering to an omniphobic surface, making them easy to clean and maintain.
- **Low wetting**: Liquids will bead up and roll off an omniphobic surface, rather than spreading out and wetting the surface. This property is known as "low wetting."
- **High contact angle**: The contact angle is a measure of how much a liquid beads up on a surface. An omniphobic surface will have a high contact angle, meaning that the liquid will bead up more on the surface.
- **Low energy**: Omniphobic surfaces typically have a low surface energy, which means that they don't easily attract other materials.
- **High stability**: The surface structure does not change over time, keeping its high hydrophobicity and oleophobicity performance

Above properties make omniphobic surfaces ideal for applications where liquids or other materials need to be repelled, such as in anti-fouling coatings, self-cleaning surfaces, water treatment, and medical devices.

It's also worth noting that some Omniphobic surfaces can also have special properties such as UV resistance, Chemical resistance, high temperature resistance and even anti-bacterial properties, depending on the coating materials and the process of creating the surface.

APPLICATIONS:

- **Marine**: Omniphobic coatings created with nanotechnology can be applied to ships and other marine structures to prevent the accumulation of scratches, shells and other marine organisms. This can help reduce drag and fuel consumption.

- **Water treatment**: Used in water treatment plants to prevent the formation of biofilms that can clog pipes and reduce the effectiveness of treatments

- **Oil and Gas**: Omniphobic coatings created with nanotechnology can be applied to oil and gas pipelines to prevent the accumulation of wax, paraffin and other substances that clog pipes

- **Medical**: omniphobic surfaces created by nanotechnologies can be used in medical devices such as catheters and stents to prevent blood clots

- **Automobile**:
  a. **Paint coatings**: applied to the exterior of cars to reduce the buildup of dirt, dust, and other substances that can make the car difficult to clean. Improves the aerodynamics of the car, which can lead to better fuel efficiency.
  b. **Windshields / Mirrors**: prevent the buildup of raindrops, which can improve visibility in rainy conditions and reduce the need for wipers.
  c. **Interior surfaces:** e.g. seats and dashboards, to to repel liquids and make them easier to clean.
  d. **Fuel systems**: fuel tanks and fuel injectors, to prevent the buildup of dirt and other substances that can clog the system and reduce performance.
  e. **Engine**: oil and coolant systems, to improve their performance and efficiency.

- **Buildings**: Omniphobic coatings created with nanotechnology can be applied to building exteriors and roofing materials to reduce dirt and dust accumulation.

- **Appliances**: Nanotechnology-engineered omniphobic coatings can be used to create non-stick surfaces on cookware, ovens, and other kitchen appliances

- **Textiles**: Nanotechnology-engineered omniphobic coatings can be applied to fabrics to resist liquids and stains.

WHY PROTECT SURFACES WITH NANO-COATINGS?

There are many reasons why surfaces may be protected with nano-coatings. Here the most important ones:

- **Improved durability and wear resistance:** Nano-coatings can improve the durability and wear resistance of surfaces, making them more resistant to scratches, corrosion, and other forms of damage.
- **Enhanced surface properties:** Nano-coatings can be used to improve the surface properties of materials, such as their hydrophobicity, oleophobicity, and self-cleaning properties. This can make surfaces more resistant to water, oil, and dirt, which can make them easier to clean and maintain.
- **Increased resistance to environmental factors:** Nano-coatings can be used to improve the resistance of surfaces to environmental factors such as UV light, heat, and chemicals. This can help to prolong the lifespan of surfaces and protect them from damage caused by exposure to these factors.
- **Improved biological performance:** Nano-coatings can be used to improve the biological performance of surfaces, by promoting cell growth, warding off bacterial infections, or preventing biofouling.
- **Energy savings:** In some applications, nano-coatings can be used to improve the energy efficiency of surfaces, for example, by reducing the amount of heat absorbed by a surface, or by reducing the amount of light reflected by a surface.
- **Cost-effectiveness:** In some cases, nano-coatings can be cost-effective solutions for protecting surfaces. Depending on the intended use, application and properties needed, nano-coatings can be a cost-effective alternative to traditional coatings or even replacement of the surface.
- **Aesthetics:** nano-coatings can be used to improve the appearance of a surface by providing it with a glossy or matte finish, or by changing its colour.
- **Improved adhesion:** Nano-coatings can be used to improve the adhesion of a coating to a surface by providing a surface modification.
- **Flexibility**: can be applied to a wide range of materials and in various forms, including coatings, films, or nanoparticles. This allows for the protection of different types of surfaces, from flat to complex geometries.
- **Multifunctional Properties**: Some nano-coatings are capable of providing multiple functionalities, such as UV-resistance, self-cleaning, and anti-fogging properties, making them more cost-effective compared to applying multiple coatings.
- **Cost savings:** nano-coatings can help reduce maintenance costs, by making surfaces more resistant to wear and tear, and by making them easier to clean. This can result in significant cost savings over time.
- **Improved corrosion resistance:** used to improve the corrosion resistance of surfaces, which can be especially beneficial in environments where the surface is exposed to moisture, salt, or chemicals.
- **Improved fire resistance**: used to improve the fire resistance of surfaces, by providing insulation or by releasing a fire-extinguishing agent when exposed to high temperatures.
- **Improved tribological properties**: Some nano-coatings can improve the tribological properties of surfaces, for example, by reducing friction and wear between surfaces in contact.
- **Anti-Static**: reduces or eliminates static electricity on surfaces. Provides a conductive layer at the nanometer scale for static charge dissipation. Benefits include improved electronic device performance, improved flow of powders, granules, and other materials and enhanced surface durability.

WHY PROTECT SURFACES WITH NANO-COATINGS?

Continued...

- **To enhance optical properties**: Some nano-coatings can be used to improve the optical properties of surfaces, such as their transmittance, reflectance, or absorption of light. This can be beneficial for applications such as solar cells, displays, or cameras.
- **To enhance electrical properties:** used to improve the electrical properties of surfaces, such as their conductivity or dielectric properties. This can be beneficial for applications such as electronic devices or energy storage.
- **To increase UV-protection:** designed to protect surfaces from the harmful effects of ultraviolet (UV) radiation. These coatings work by absorbing, reflecting, or scattering UV radiation, reducing the amount of UV energy that reaches the underlying surface.
- **To improve Thermal properties:** used to improve the thermal properties of surfaces, such as thermal conductivity and insulation. This can be beneficial for applications such as electronics, energy generation, and aerospace.
- **To improve mechanical properties:** Some nano-coatings can be used to improve the mechanical properties of surfaces, such as strength, toughness, and hardness. This can be beneficial for applications such as construction, machinery, and aerospace.
- **To reduce VOC emissions**: Some nano-coatings, such as self-cleaning coatings, can be used to reduce volatile organic compounds (VOCs) emissions. These types of coatings can help to minimise the negative impact of coatings on the environment and human health.
- **To improve barrier properties**: used to improve the barrier properties of surfaces, such as gas and water permeability. This can be beneficial for applications such as packaging, construction, and biomedical devices.
- **To enhance catalytic properties:** used to improve the catalytic properties of surfaces. This can be beneficial for applications such as energy generation, chemical production, and environmental purification.
- **To increase service life:** Some nano-coatings can increase the service life of a surface, by providing better protection and durability, which can result in significant cost savings over time.
- **To add Anti-slip properties:** designed to improve the slip resistance of surfaces. These coatings work by creating a rough, textured surface on the material, which increases the friction between the surface and the soles of shoes or other forms of contact. Helps to reduce the likelihood of slips and falls, especially on surfaces that are wet or oily.
- **To improve environmentally preserving properties:** reducing the amount of pollutants emitted by a surface, or by reducing the amount of energy needed to heat or cool a building, etc.
- **To lower application costs:** Nano-coatings can be applied using various methods, like dipping, spraying, and spinning, which can result in simpler and lower application costs compared to traditional coatings.
- **To add Anti-Microbial properties:** designed to inhibit the growth of microorganisms on surfaces. Widely used in various applications such as medical devices, food processing, and building materials, pharma and healthcare settings. Popular since Covid 19 pandemic.

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TOP 40 NANOCOATING USE-CASES

Nanocoatings [NCs] can be used in a wide range of purposes. Here some of the most common ones - in no particular order and by no means exhaustive:

- **Anti-fouling coatings for marine surfaces**, which prevent the growth of marine organisms, increase the efficiency of ships and oil platforms, and reduce the need for regular cleaning and maintenance.
- **Corrosion protection coatings for metal surfaces**, which protect against rust and corrosion, extend the lifespan of pipelines and offshore structures and reduce the need for frequent repairs and replacement.
- **Self-cleaning coatings for building facades and solar panels**, which reduce the need for cleaning and maintenance, improve the efficiency of these surfaces, and keep them looking clean and new for longer.
- **Anti-graffiti coatings for buildings and public transportation**, which make surfaces resistant to graffiti and tagging, reducing the need for costly clean-up, and helping to maintain the appearance of urban areas.
- **Hydrophobic/hydrophilic coatings**, which control the behaviour of water droplets on surfaces, making them easy to clean, reducing water waste, and allowing them to repel or absorb liquids.
- **Icephobic coatings for aircraft and other transportation equipment**, which prevent ice buildup, improving safety and reducing the need for de-icing, thus reducing the environmental impact.
- **UV-protection coatings for plastics and glass**, which protect these materials from UV rays, reducing the deterioration and discoloration caused by UV radiation, and prolonging the lifetime of these materials.
- **Antimicrobial coatings for medical and food processing applications**, which prevent the growth of microorganisms on surfaces, reducing the spread of infection, and ensuring a safe environment.
- **Antistatic coatings for electronic devices and equipment**, which prevent the buildup of static electricity, reducing the risk of electrical discharges, and protecting sensitive electronic components.
- **NCs to increase resistance to wear and tear**, used on machinery and equipment, extending the lifetime of these items, reducing the need for repairs and replacements.
- **Fuel-efficient NCs for vehicles and transportation equipment**, which improve fuel efficiency, reducing the environmental impact and saving costs.
- **NCs to improve optical properties**, used on lenses, mirrors and other optical components, increasing the efficiency and clarity of these items.
- **Thermal insulation NCs for buildings and industrial equipment**, which reduce heat loss and energy consumption, saving costs and reducing greenhouse gas emissions.
- **Fire-resistant NCs for buildings and other structures**, which improve fire safety and protect against fire damage.
- **Anti-slip NCs for floors, stairs and other surfaces**, which improve safety and reduce the risk of accidents.
- **Paint protection NCs for cars, trucks and other vehicles**, which protect the paint from wear and tear, and keep the vehicle looking new for longer.
- **Biocompatible NCs for medical devices and implants**, which are safe for use in the human body and reduce the risk of infection.
- **Durable NCs for textiles, clothing and other fabrics**, which increase the lifespan of these items and reduce the need for replacements.

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TOP 40 NANOCOATING USE-CASES

Continued...

- **Superhydrophobic NCs for water management**, which provide water repellency and easy cleaning, reducing water waste and making surfaces easy to maintain.
- **Self-cleaning NCs for industrial equipment and other surfaces**, which reduce the need for cleaning and maintenance, saving time and resources.
- **Photocatalytic NCs**, which can break down pollutants and purify the air and water when exposed to sunlight, improving the environment.
- **NCs that mimic the properties of natural surfaces** such as lotus leaves and shark skin, known as "biomimetic coatings", which can provide advanced properties such as water repellency and self-cleaning.
- **NCs for improved adhesion and bonding**, which can be used to improve the strength of composite materials and other products by increasing the surface energy. These coatings can be used to enhance the adhesion between different materials, increase the durability of products, and reduce the risk of delamination or cracking.
- **NCs for energy storage**, which can be used to improve the performance of batteries and other energy storage devices by reducing resistance and increasing capacity. These coatings can be used to improve the conductivity of electrodes, reduce the growth of dendrites, and increase the overall energy density of batteries.
- **NCs for improved thermal conductivity**, which can be used to improve the performance of electronic devices and other products that generate heat by dissipation of heat. These coatings can be used to reduce the thermal resistance of devices, improve the cooling efficiency of heat sinks, and increase the power density of electronic devices.
- **NCs for improved electrical conductivity**, to improve the performance of electronic devices and other products that rely on electrical conductivity by reducing resistance. Used to increase the conductivity of electrodes, reduce the resistance of interconnects, and improve the overall performance of electronic devices.
- **NCs for improved lubrication**, which can be used to reduce friction and wear in machinery and other products by creating a lubricating film. Used to reduce the coefficient of friction, increase the wear resistance, and extend the lifetime of machinery and equipment
- **NCs for improved barrier properties**, which can be used to protect products from moisture, gases, and other environmental factors. Used to increase the barrier properties of packaging materials, prevent the ingress of water, oxygen and other gases, prolonging the shelf life of products.
- **NCs for improved UV stability**, which can be used to protect products from UV radiation and prolong their lifetime. Used to prevent discolouration, cracking, and other forms of UV damage in plastics, coatings, and other materials.
- **NCs for improved biocompatibility**, which can be used to reduce the risk of infection in medical devices and other products used in contact with the human body. Used to prevent the growth of bacteria and other microorganisms, and to make products more biocompatible by reducing toxicity, irritation, and other forms of adverse effects.
- **NCs for improved flame retardancy**, which can be used to improve the fire safety of products and protect against fire damage. Used to prevent the spread of fire, reduce the heat release rate, and lower the smoke density of products, making them safer and more fire-resistant.
- **NCs for improved gas permeability**, which can be used to control the flow of gases through products and improve their performance. Used to control the permeation of gases through packaging materials, sensors, and other products, and to improve their performance by allowing the right amount of gas to pass through.

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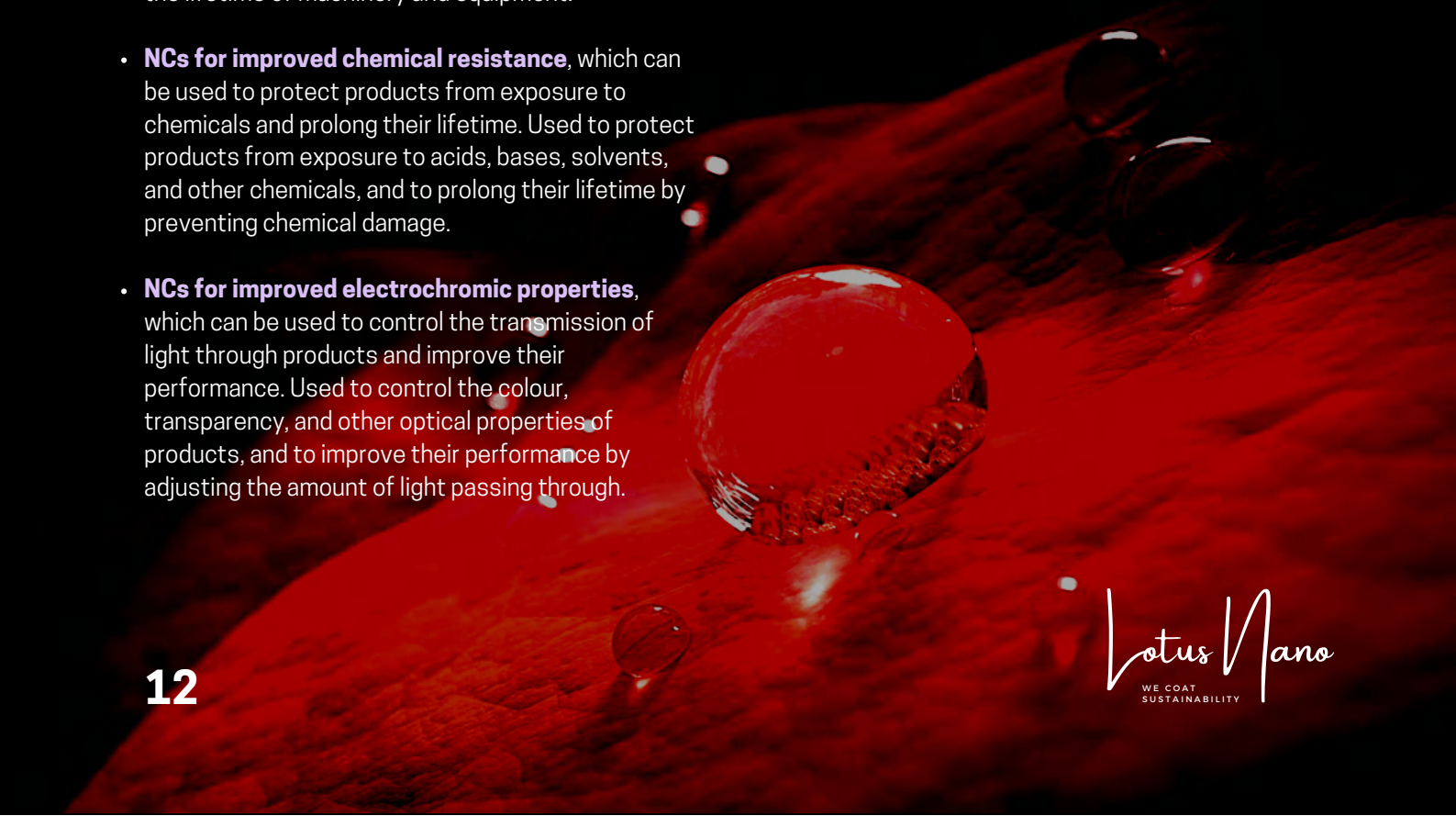
TOP 40 NANOCOATING USE-CASES

Continued...

- **NCs for improved electrical insulation**, which can be used to improve the safety and performance of electronic devices and other products that rely on electrical insulation. Used to prevent electrical discharges, protect against electrical overloading, and improve the overall performance of electronic devices by increasing the dielectric strength of insulation materials.
- **NCs for improved electrostatic dissipation**, which can be used to reduce the risk of electrical discharge in electronic devices and other products. Used to reduce the buildup of static electricity, protect sensitive electronic components, and improve the overall performance of electronic devices by preventing electrical discharges.
- **NCs for improved tribological properties**, which can be used to reduce friction and wear in machinery and other products. Used to reduce the coefficient of friction, increase the wear resistance, and extend the lifetime of machinery and equipment.
- **NCs for improved chemical resistance**, which can be used to protect products from exposure to chemicals and prolong their lifetime. Used to protect products from exposure to acids, bases, solvents, and other chemicals, and to prolong their lifetime by preventing chemical damage.
- **NCs for improved electrochromic properties**, which can be used to control the transmission of light through products and improve their performance. Used to control the colour, transparency, and other optical properties of products, and to improve their performance by adjusting the amount of light passing through.
- **NCs for improved biodegradability**, which can be used to reduce the environmental impact of products and make them more sustainable. Used to enhance the biodegradability of products, make them more eco-friendly and decompose easily in the environment.
- **NCs for improved self-healing properties**, which can be used to repair small damages in products and prolong their lifetime. Used to repair small cracks, scratches, and other forms of damage in products, making them more durable and longer lasting.
- **NCs for improved superconductivity**, which can be used to improve the performance of electronic devices and other products that rely on superconductivity. Used to enhance the superconductive properties of materials, reduce resistance and increase the efficiency of electronic devices.



Lotus Nano
WE COAT SUSTAINABILITY

WHAT SURFACES CAN BE NANO-COATED?

A wide range of materials can be nano coated, including metals, ceramics, polymers, and composites. Some common examples include:

- **Metals:** Metals such as aluminium, steel, and titanium can be nano coated to improve their corrosion resistance, wear resistance, and tribological properties.
- **Ceramics**: Ceramic materials such as alumina, silicon carbide, and zirconia can be nano coated to improve their wear resistance, corrosion resistance, and biocompatibility.
- **Polymers**: Polymers ('plastics') such as polyethylene, polypropylene, and polycarbonate can easily be nano coated to improve their wear resistance, corrosion resistance, microbial resistance and tribological properties.
- **Composites**: Composites such as fibre-reinforced polymers, metal-matrix composites, and ceramic-matrix composites can be nano coated to improve their wear resistance, corrosion resistance, and tribological properties.
- **Glasses**: Glass can be nano coated with various materials, such as titanium dioxide, silicon dioxide or zinc oxide to improve its hydrophobicity, scratch resistance, and UV protection.
- **Biomaterials**: Biomaterials such as biodegradable polymers, natural fibres, and ceramics can be nano coated to improve their bioactivity and biocompatibility.
- **Semiconductors**: Semiconductor materials such as silicon and gallium arsenide can be nano coated to improve their electrical and optical properties
- **Biomedical implants:** Biomedical implants such as surgical instruments, pacemakers, and dental implants can be nano coated to improve their biocompatibility and reduce the risk of infection.
- **Textiles:** Textile materials such as cotton, wool, and synthetic fabrics can be nano coated to improve their water and stain resistance, UV protection, and antimicrobial properties.
- **Concrete:** Concrete and other construction materials can be nano coated with materials such as silica and titanium dioxide nanoparticles to improve their strength, durability, and self-cleaning properties.
- **Woods / Fibres:** improve its durability, resistance to moisture and stains, and overall appearance. There are several different types of nano-coating that can be used on wood, depending on the desired outcome.
- **Brick and stone:** applied to provide water repellency, which can help to prevent water penetration and staining. These coatings can also provide protection against mould, mildew and other germs
- **Ceramic and marble:** nanocoatings can provide resistance to stains, scratches, and etching. They can also provide protection against water and other liquids, making them easier to clean and maintain. Certain nanomaterials can offer an anti-slip effect

It's important to keep in mind that not all materials can be nano coated, or the properties of the materials may not benefit from a nano coating.

Find out in the next section why Nano coatings may not be able to protect a substrate as desired - and simply fail.

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HOW ARE NANO-COATINGS APPLIED?

The most common application techniques used today. Available with or through Lotus Nano:

- **Sol-gel method:** Involves the synthesis of a coating material in a liquid solution, which is then applied to the substrate and cured to form a solid coating. This method can be used to apply a wide range of coatings including, but not limited to, metal oxides, ceramic and hybrid materials. The sol-gel process can be applied by dip-coating, spin-coating or spray-coating techniques.

- **Physical vapour deposition (PVD)**: PVD involves the evaporation of a coating material in a vacuum chamber, where it condenses onto the substrate. PVD can be carried out by several techniques such as thermal evaporation, cathodic arc evaporation, sputter deposition, and electron-beam evaporation. PVD coatings can be applied on various substrate materials, including metals, ceramics, and polymers.

- **Chemical vapour deposition (CVD):** CVD involves the chemical reaction of gaseous precursors to form a solid coating on the substrate. The CVD process can be carried out at high temperatures (typically greater than 600 °C) or at room temperature, depending on the coating material and the substrate. CVD coatings can be applied on various substrate materials, including metals, ceramics, and polymers.

- **Electrodeposition:** Involves the application of an electric current to deposit a coating material onto the substrate. The process occurs in an electrolytic cell, where the substrate is the cathode and the coating material is dissolved in the electrolyte. Electrodeposition can be used to apply a wide range of coatings including, but not limited to, metals and alloys.

- **Spray coating:** Involves the use of a spray gun to apply a liquid coating material to the substrate. Spray coating is widely used in industries such as automotive, aerospace, and architectural coatings. The method is efficient and can be used to apply thick coatings in a short time.

- **Dip coating:** Involves immersing the substrate in a liquid coating material and then removing it to form a thin film on the surface. Dip coating can be used to apply a wide range of coatings including, but not limited to, polymers, ceramics and metals. The process is simple and cost-effective, making it popular in several industries.

- **Spin coating:** Involves spinning the substrate at high speeds while coating material is applied to the substrate. The centrifugal force causes the coating material to spread evenly over the substrate surface. This method is commonly used to apply thin films of polymers and other organic materials.

- **Inkjet printing:** Involves the use of a specialised inkjet printer to apply nano-coatings onto the substrate. The process is highly precise and can be used to apply coatings with complex patterns and structures. This method is commonly used in the electronics and biomedical industries.

- **Rolling or doctor blade method:** Involves spreading a coating material on a roller or blade and then pressing it onto the substrate. This method is commonly used to apply thin films of polymers and other organic materials.

- **Electro-spinning:** Involves the creation of fibres from a polymer solution or melt by applying a high-voltage electric field. The fibres are collected on a substrate to form a thin film coating. This method is commonly used to apply coatings for biomedical and electronic applications.

There are some more application techniques such as Atomic Layer Deposition (ALD), electroless plating, electrostatic spraying, thermal spraying, electroplating, chemical vapour infiltration (CVI), etc.

All of these methods have their own advantages and disadvantages. The choice of method will depend on the specific desired properties of the coating.

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WE COAT SUSTAINABILITY

CAN NANO-MATERIALS IMPROVE OTHER COATINGS?

Absolutely. There are several key advantages to using nano-enriched materials in other conventional coatings.

- **Improved mechanical properties:** The incorporation of nanomaterials can enhance the mechanical properties of conventional coatings such as hardness, wear resistance, and impact resistance.
- **Enhanced barrier properties:** Nanomaterials can be used to improve the barrier properties of coatings, such as water and vapour resistance, and UV protection.
- **Improved durability:** The incorporation of nanomaterials can improve the overall durability of coatings by increasing their resistance to environmental factors such as corrosion, weathering, and UV radiation.
- **Enhanced functionalities:** The incorporation of nanomaterials can provide coatings with enhanced functionalities such as self-cleaning, anti-microbial, anti-fogging, and more.
- **Cost-effective:** The incorporation of nanomaterials can provide cost-effective solutions, as they can often be used in small amounts to improve the performance of conventional coatings.
- **Environmentally friendly**: Many nanomaterials are biodegradable and can help to reduce the environmental impact of coatings.
- **Improved coating performance:** The incorporation of nanomaterials can improve the performance of coatings by increasing their durability, wear resistance and corrosion resistance, thus reducing maintenance and replacement costs.
- **Increased efficiency:** The use of nanomaterials can help to increase the efficiency of coatings by reducing the amount of material required to achieve a certain level of performance.
- **Improved optical properties**: The incorporation of nanomaterials can improve the optical properties of coatings, such as colour, transparency, and reflectivity.
- **Increased flexibility:** The incorporation of nanomaterials can provide coatings with increased flexibility, which can be useful for applications that require coatings to be applied to flexible substrates.
- **Enhanced electrical properties**: The incorporation of nanomaterials can improve the electrical properties of coatings, such as conductivity, dielectric constant, and permittivity.
- **Enhanced thermal properties:** The incorporation of nanomaterials can improve the thermal properties of coatings, such as thermal conductivity, thermal stability, and heat resistance.
- **Better adhesion**: The incorporation of nanomaterials can enhance the adhesion of coatings to various substrates, resulting in a better bonding of the coating to the substrate.
- **Enhanced anti-corrosion**: The incorporation of nanomaterials can improve the anti-corrosion properties of coatings, resulting in a coating with improved durability.
- **Enhanced anti-fouling:** The incorporation of nanomaterials can improve the anti-fouling properties of coatings, resulting in a coating with improved performance in marine and underwater applications.

Lotus Nano
WE COAT SUSTAINABILITY

CAN NANO-COATINGS FAIL?

There are several reasons why some nanocoatings may not achieve their desired effect. Some of the most common reasons include:

- **Inadequate surface preparation:** In order for a nanocoating to properly adhere to a surface, it is important that the surface is thoroughly cleaned and prepared before application. If the surface is not properly cleaned or if there is residual contamination, the nanocoating may not properly bond to the surface, leading to premature failure.

- **Improper application:** Applying a nanocoating improperly, such as using the wrong application method or applying too thin / thick of a coating can lead to uneven coverage and poor performance. Also, not curing the coating properly can lead to a weaker bond.

- **Environmental factors:** Certain environmental factors, such as extreme temperatures, UV exposure, and exposure to chemicals or abrasives can cause nanocoatings to degrade and fail prematurely. If a coating is not designed to withstand the specific environmental conditions it will be exposed to, it may not provide the desired level of protection.

- **Lack of robustness:** Some coatings that are designed for specific applications may not be robust enough to withstand the wear and tear of daily use and degrade over time, causing the coating to fail.

- **Lack of quality control:** Some coatings may fail due to lack of quality control during the production process. This can lead to inconsistencies in the composition and properties of the coating, resulting in poor performance and premature failure.

- **Durability**: Due to their small size, nanoparticles in the coatings may be more prone to migration or aggregation, which can lead to decreased performance and coating failure over time.

- **Stability**: some coatings may degrade due to chemical reactions with other substances such as humidity or acids. This can lead to loss of properties and a decrease in the performance of the coating.

- **Lack of proper testing and validation:** While lab testing is important for understanding the properties and potential of a coating, it is also essential to conduct real-world testing to evaluate the coating's performance under actual use conditions. This can help identify potential issues and allow for adjustments to be made before the coating is released for commercial use.

- **Material composition:** Some materials, such as glass, ceramics, and metals, have a smooth, homogenous surface that is well suited for nano-coating. Other materials, such as wood or textiles, may have a more porous or irregular surface that makes it more difficult to apply a consistent coating.

- **Surface morphology:** Materials with smooth surfaces are generally more suitable for nano-coating than those with rough or irregular surfaces. The surface roughness can affect the amount of coating material that can adhere to the surface and how evenly the coating will be applied.

- **Coating type:** Different types of nano-coatings may have different requirements for the surface they are applied to. For example, a hydrophobic coating may work well on a smooth, non-porous surface, whereas an anti-corrosion coating may be more suitable for a metal surface.

- **Material compatibility**: It's important to make sure that the coating material is chemically and physically compatible with the material that the coating is to be applied to, because the coating could cause damage or discolouration to the surface.

Lotus Nano
WE COAT SUSTAINABILITY

NANO-PROTECTION BY INDUSTRY

Examples - here's how different industries use Nanotech. Ask Lotus Nano for assistance.

- **Automotive**: to improve the durability and performance of automotive components, such as engine parts, transmission gears, and suspension components. Hard coatings, for example, can be used to improve the wear resistance of engine parts and gears, whereas anti-corrosion coatings can be used to protect metal parts from rust and corrosion.

- **Aerospace**: to improve the performance of aerospace components, such as aircraft engines, airframes, and landing gear. Can be used to improve the wear resistance of engine parts and gears, whereas thermal barrier coatings can be used to reduce heat transfer and improve thermal insulation.

- **Construction**: to improve the durability and performance of construction materials, such as concrete, bricks, and roofing materials. Self-cleaning coatings can be used to make building facades easier to clean, whereas anti-corrosion coatings can be used to protect metal roofing from rust and corrosion. Anti-graffiti coatings too find more

- **Energy:** to improve the performance of energy-related products and materials, such as solar panels, wind turbine blades, and electrical wiring. Hydrophobic coatings can be used to reduce the amount of dirt and grime that adheres to solar panels, while omniphobic coatings can be used to protect wind turbine blades from the elements.

- **Energy storage:** to improve the performance of energy storage devices, such as batteries and fuel cells. For example, lithium-ion batteries can be coated with materials that improve their energy density, charge-discharge rate, and durability.

- **Electronics**: to improve the performance of electronic devices, such as smartphones, tablets, and laptops. For example, hydrophobic coatings can be used to protect electronic devices from water damage, while anti-bacterial coatings can be used to protect them from bacteria.

- **Environmental**: to improve the performance of environmental remediation products, such as filters, catalysts, and membranes. E.g., photocatalytic coatings can be used to break down pollutants in air or water, while anti-fouling coatings can be used to prevent the buildup of biofilm in filters.

- **Facility Management:** to improve the performance and durability of various surfaces in nearly any space we live in. Here a few examples:

    - **Walls and ceilings**: to improve the durability and resistance to stains of walls and ceilings. Self-cleaning coatings can be used to make walls and ceilings easier to clean, while anti-bacterial coatings can be used to inhibit the growth of bacteria on the surface.

    - **Floors**: to improve the durability and resistance to stains of floors. Coatings can be used to improve the scratch resistance of flooring materials, while hydrophobic coatings can be used to make floors more resistant to water and other liquids. Other coatings can create an anti-slip effect. Others can reflect UV/IR rays and keep the floor cooler.

    - **Windows**: improve the durability and performance of windows. Certain coatings can be used to have a long-lasting self-cleaning effect or to improve the scratch resistance of glass, while UV blocking coatings can be used to protect window frames from fading or discolouration caused by exposure to sunlight.

    - **Bathrooms and kitchens**: to make surfaces more resistant to water and other liquids, while anti-microbial coatings can be used to inhibit the growth of germs on the surface.

    - **Furniture**: to improve the scratch resistance of furniture surfaces or protect them from the sun, while hydrophobic coatings can be used to make furniture more resistant to water and other liquids and achieve an easy-clean effect.

NANO-PROTECTION BY INDUSTRY

Continued...

- **Wood furniture**: to improve the durability, resistance to moisture and stains, and overall appearance of wood furniture. Hydrophobic coatings can be used to make wood surfaces more resistant to water and other liquids, while UV blocking coatings can be used to protect wood from fading or discolouration caused by exposure to sunlight.
- **Stainless steel fixtures**: to improve the resistance to corrosion and stains of stainless steel fixtures. Anti-corrosion coatings can be used to protect stainless steel from rust and corrosion, while anti-fingerprint coatings can be used to reduce the visibility of fingerprints on the surface.
- **Glass fixtures**: to improve the durability and performance of glass fixtures. Nanocoatings can be used to improve the scratch resistance of glass, while hydrophobic coatings can be used to create the famous Lotus Effect.
- **Upholstery**: to improve the resistance to stains and spills of upholstery. Hydrophobic coatings can be used to make fabrics more resistant to water and other liquids, while anti-bacterial coatings can be used to inhibit the growth of bacteria on the surface.

- **Industrial / Manufacturing:** to improve the durability and performance of products, machine parts, tools, and other industrial equipment and components. Nanocoatings are used to improve the wear resistance, while anti-corrosion coatings can be used to protect metal parts from rust and corrosion.
- **Food and Beverage:** to improve the durability and performance of food processing equipment, such as conveyor belts, cutting tools, etc. Or to improve the safety and shelf life of food products by inhibiting the growth of bacteria, fungi and viruses the surfaces.
- **Marine**: to improve the performance of marine-related products, such as boats, ships, and offshore platforms. Anti-fouling coatings can be used to prevent the buildup of barnacles and other organisms on boat hulls, while anti-corrosion coatings can be used to protect metal parts of ships and offshore platforms from rust and corrosion.
- **Manufacturing and machinery**: to improve the performance of manufacturing equipment and machinery. Hard coatings, for example, can be used to improve the wear resistance of cutting tools and machine parts, while anti-corrosion coatings can be used to protect metal parts from rust and corrosion.
- **Optics**: to improve the performance of optical devices, such as cameras, telescopes, and eyeglasses. For example, anti-reflective coatings can be used to reduce glare and improve image quality, while hard coatings can be used to improve the durability of lenses.
- **Packaging**: to improve the performance of packaging materials, such as bottles, cans, and bags. For example, oxygen-barrier coatings can be used to extend the shelf life of packaged food, while anti-counterfeit coatings can be used to protect against counterfeiting and fraud.
- **Pharma / Healthcare:** to improve the performance and safety of medical devices and equipment, such as implants, pacemaker, catheters, and more. These coatings can reduce the chances of infection, improve the durability of devices, and reduce the rejection rate by the body.
- **Water treatment:** used in water treatment systems to improve their efficiency and performance. For example, anti-fouling coatings can be used to prevent the buildup of biofilm in water treatment systems, while photocatalytic coatings can be used to break down contaminants in water.
- **Heating, Ventilation, Air-Conditioning (HVAC)**: to improve flow performance and efficiency and to protect the equipment from damage and deterioration. Generally strong antimicrobial properties achieve reduction of spread of air-borne diseases in enclosed environments.

NANO-PROTECTION BY INDUSTRY

Continued...

- **Textile:** In the textile industry, nano-coatings can be used to improve the performance and durability of textiles and fibres, such as clothing and upholstery. Hydrophobic coatings can be used to make fabrics more resistant to water and other liquids, while anti-bacterial coatings can be used to inhibit the growth of bacteria on the surface.

- **Infrastructure:** Nano-coatings can be used to protect the surfaces of government buildings, bridges, roads, and other infrastructure from weathering, corrosion, and other forms of damage. These coatings can help to extend the lifespan of the infrastructure and reduce the need for frequent maintenance and repairs.

- **Military**: Nano-coatings can be used to protect the surfaces of military equipment such as vehicles, weaponry, electronics and other equipment from weathering, corrosion, and other forms of damage. These coatings can help to extend the lifespan of the equipment and improve its performance even in harsh conditions.

- **Water treatment**: to improve the performance and efficiency of water treatment systems. Anti-fouling coatings can be used to prevent the buildup of biofilm in water treatment systems, while photocatalytic coatings can be used to break down contaminants in water.

- **Law enforcement**: to improve the performance and durability of bulletproof vests and other protective gear, to make them more resistant to wear and tear, and to improve their ability to stop bullets.

- **Paint & Coatings:** to improve the performance and durability of paint products. These coatings can be used to create self-cleaning, anti-microbial, UV protective, scratch resistant, waterproof and fire resistant, etc. paint products. This can be useful for various applications such as hospitals, food processing facilities, exterior surfaces, heavy traffic area, surfaces exposed to water and buildings at risk of fire.

- **Agriculture:** to improve the performance and durability of agricultural equipment and products. Increasingly used to protect plants from pests and diseases, to improve their growth and yield, and to enhance the efficiency of fertilisers and pesticides. They can be applied to seed and plant surfaces, fertiliser and pesticide delivery systems, and agricultural equipment. The use of nano-coatings in agriculture can help to increase crop yields, reduce the need for chemical pesticides, and improve the efficiency of farming operations.

These are a few examples of how different industry sector make specific use of 21. Century Nanotechnology solutions.

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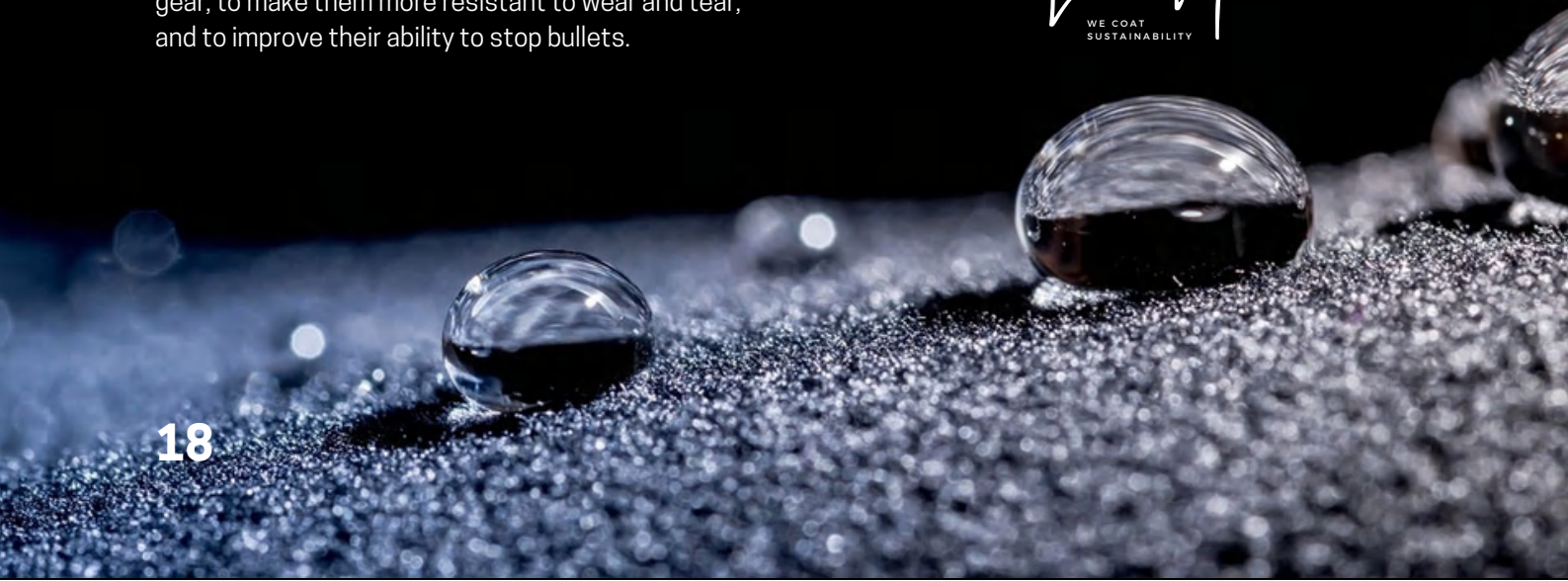

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NANOTECH CAN SOLVE MANY INDUSTRIAL CHALLENGES. HERE'S HOW WE ASSIST OUR CLIENTS EVERY STEP OF THE WAY

INDEPENDENT ADVISE, CONSULTING, FREE TRIALS
We make sure we first understand you and you understand Nano Surface Coatings. We run free product trials to determine what works best for you. We find bespoke automation solutions & train your people and so much more.

PROPER SURFACE PREPARATION:
We make sure the surface to be coated is properly cleaned and conditioned to ensure that the coating adheres properly and provides the desired performance.

STRICT QUALITY CONTROL
We make sure the coating material we specify for you is of highest quality, purity and consistency to ensure that it performs as expected and consistently produces the desired properties.

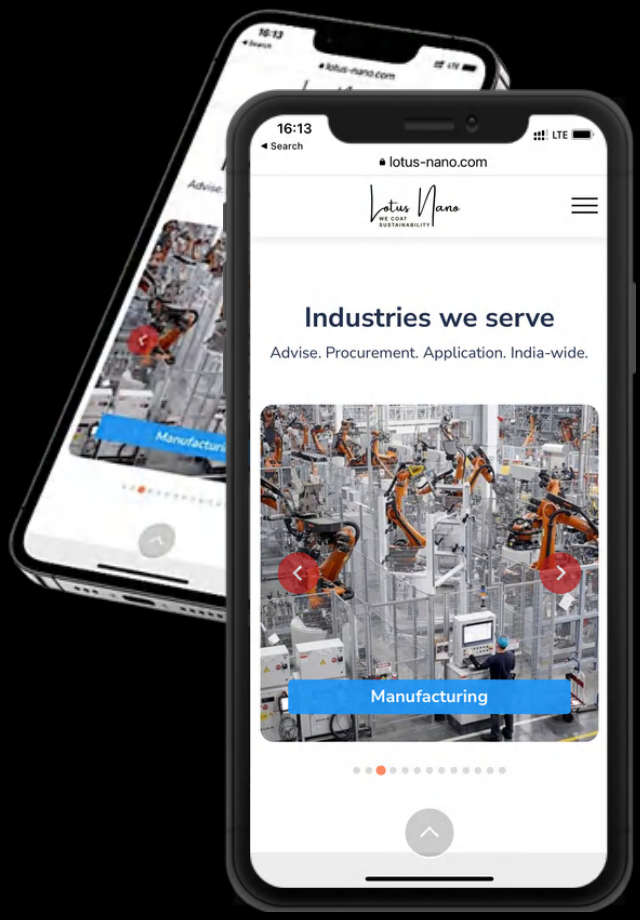
COMPATIBILITY WITH THE SUBSTRATE:
We ensure every nanocoating material is compatible with every substrate, adheres properly and doesn't cause any damage or degradation.

SAFE & EXPERT LED APPLICATION:
We apply the nano coating using the most appropriate techniques and equipment to ensure a safe and successful experience.

OPTIMAL DRYING AND CURING:
We ensure the drying and curing process is carefully controlled to ensure the coating is achieves the best possible desired effect.

POST-PROCESSING AND MAINTENANCE:
Coated surface need to be maintained and protected in order to preserve the performance of the coating over time. We'll help you with that.

MAKE IN INDIA



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