



## Permanon

From Wikipedia, the free encyclopedia

Permanon is the trademark name for a line of nano engineered finishes for hard surfaces developed in Germany by Permanon GmbH and has found applications in marine, transportation, and janitorial/maintenance settings. Since its incorporation in 1997, the company specializes in the research and development of new and highly potential methods to clean and protect surfaces. Although production is divided into several segments, in general, it is aimed at prevention of contaminating particles penetrating into the pores of surfaces, and long-term protection of surfaces. Permanon plays an active role in protection of the environment - all Permanon products are subject for environmentally friendly decomposition. Permanon can be truly categorized as a "Green" Product. It is made out of natural ingredients (Silicium and water based) and it reduces by up to 80% the need of aggressive cleaning chemicals and agents which do harm the environment.

Permanon is a leading-edge High-tech development in terms of surface-protection and cleaning on the basis of pure monomolecular Silicium. Silicium, with the abbreviation SI14 in the periods system, is a natural product and is, after H<sub>2</sub>O, the most frequently occurring element on earth. Silicium is found in sand, glass as well as in the human body. Even in the medical field, Silicium is used in the research and development of new medicines. Permanon products with Silicium do not undergo any chemical reaction with the material to be coated. Through a complex procedure, it was managed to create a static attractive force on all materials, without damaging the materials. Conventional waxes or silicone-oil combinations become now unnecessary.

Permanon products are exclusively available as a high concentrate and these concentrates can be diluted with water with an applied concentration of 1% to 10%, depending on the type of surface (10-100ml concentrate on 1litre of water). The "protection" with Silicium: Any smooth surface, under microscopic enlargement, is a landscape made out of mountains and seas, which fill it with dirt and dust particles and/or water in the capillaries. Without surface-protection it is quite hard to clean these micro-layers; for this, usually aggressive cleaners are required. With the use of Permanon-products you can act non-polluting, efficiently and simply, for Permanon-products with Silicium do not undergo any chemical connection with the material to be coated on. Resulting in a value conserving care for the surface.

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# Nanotechnology

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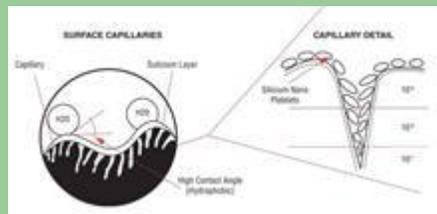
*For the materials science journal see [Nanotechnology \(journal\)](#).*

**Nanotechnology** (sometimes shortened to "**nanotech**") is the manipulation of matter on an [atomic](#) and [molecular](#) scale. Generally, nanotechnology works with materials, devices, and other structures with at least one dimension sized from 1 to 100 [nanometres](#). [Quantum mechanical](#) effects are important at this [quantum-realm](#) scale. With a variety of potential applications, nanotechnology is a key technology for the future and governments have invested billions of dollars in its research. Through its [National Nanotechnology Initiative](#), the USA has invested 3.7 billion dollars. The European Union has invested 1.2 billion and Japan 750 million dollars.<sup>[1]</sup>

Nanotechnology is very diverse, ranging from extensions of conventional [device physics](#) to completely new approaches based upon [molecular self-assembly](#), from developing [new materials](#) with dimensions on the nanoscale to [direct control of matter on the atomic scale](#).

Nanotechnology entails the application of fields of science as diverse as [surface science](#), [organic chemistry](#), [molecular biology](#), [semiconductor physics](#), [microfabrication](#), etc.

Scientists debate the future [implications of nanotechnology](#). Nanotechnology may be able to create many new materials and devices with a vast range of [applications](#), such as in [medicine](#), [electronics](#), [biomaterials](#) and energy production. On the other hand, nanotechnology raises many of the same issues as any new technology, including concerns about the [toxicity](#) and environmental impact of nanomaterials,<sup>[2]</sup> and their potential effects on global economics, as well as speculation about various [doomsday scenarios](#). These concerns have led to a debate among advocacy groups and governments on whether special [regulation of nanotechnology](#) is warranted.



Manufactured surfaces have microscopic defects known as capillary structures where dirt, dust, moisture and chemical residue tend to collect. The Silicon nanoparticles closely follow the surface contour of these capillaries to fill and seal up to 90% of the volume, helping to keep the part clean.

## Keeping it Clean with Nanocoatings

Article From: Process Cleaning, James Deardorff, President from Superior Coatings

**Posted on:** 7/1/2011

American manufacturers have long realized the importance of process cleaning during production to maximize the value of new products, but they rarely provide detailed instructions and guidelines about keeping products clean and protected once they are received by the customer or after they are put into service. With certain products, even routine handling or limited environmental exposure can lead to corrosion or buildup of dirt and soils that can interfere with quality and performance.

The EPA recently issued a report on the effects of acid rain pollution on factory coatings. Acid rain is produced when fossil fuels are converted into energy; its major components are nitrous oxide and sulfur dioxide. When these compounds mix with moisture, they produce an acid that can damage paints and coatings. Acid rain also is hygroscopic, meaning it draws and retains moisture from the atmosphere.

Permanon is a nanocoating developed in Germany to protect factory coatings and finished surfaces against dirt, corrosion, chemical compounds and other soils that affect the usability of manufactured



products. The main component of this surface protectant is Silicium (Si-14), a highly compounded component of glass. When Silicium is incorporated in a proprietary water-based polymer, it is transformed into a highly effective, ultra-thin coating suitable for virtually any hard surface.

## **SILICIUM**

Periodic Table Symbol Si - Atomic Number 14 - Mohs Hardness 7 - CAS-No. 7440-21-3

**Silicium is the second most abundant element in Earth's crust after oxygen, however, it doesn't readily occur in its elementary form. It readily combines with oxygen to form silicates such as silicon dioxide (common sand).**

## **What is Nanotechnology?**

Permanon's properties are based on the science of nanotechnology, which is the creation, organization, or manipulation of materials, devices, or systems at the nano level. To understand nanotechnology, it is important to understand the ultra-small measurements involved. A meter equals 39.37 inches, a centimeter is one hundredth of a meter, a millimeter is a thousandth of a meter, and a micrometer is a millionth of a meter. A nanometer is one billionth of a meter. For another perspective, a single red blood cell is 2,500 nanometers in size. A pin head is approximately one millimeter in diameter and equal to the surface area of one billion nanometers. Permanon is applied at a film thickness of 100 nanometers, or less than 1/500 the thickness of a human hair.

## **How It Works**

Virtually all manufactured surfaces (including paints and coatings) are porous and contain microscopic defects that, when magnified, can appear like the peaks and valleys of a mountain range. These irregularities are known as capillary structures, and millions of them may exist within a single square inch. Fine dirt, dust, moisture and chemical residue are drawn into these voids, where they can be extremely hard to remove. Capillary structures also provide microbes, bacteria and germs with an excellent place to grow and multiply.

Traditional coatings usually contain a resin binder, pigments, and a solvent or water-based vehicle that evaporates away during curing. The resin binder is the glue that holds the pigments in suspension. Adhesion is the result of the chemical interaction between the coating and surface. The degradation of the resin binder through contact with sunlight, weathering, chemicals or biological attack is the main reason coating life is limited.

The initial Permanon application can last as long as one year, and reapplication can extend service life indefinitely. During reapplication, the product will not stick to itself. Instead, the Silicium particles locate damage points, re-bonding only with the base surface and restoring full performance functionality. Even with repeated reapplication, the coating can protect surfaces without buildup of excessive film thickness.

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The surface protectant has no resin binder but rather only the Silicium nanoparticles and a macromolecular polymer. It is bonded to the base material by electrostatic attraction. This effect is produced by the positive charge of the Silicium particles and the negative charge of the surface. No reaction time is required. As soon as the Silicium particles come in contact with a base material, the curing process is complete.

Elimination of the resin binder and the filling of the capillary structures with Silicium help produce an easy-to-clean surface profile. The Silicium particles are lamina shaped, like scales of a fish. These platelets are deposited on the capillary walls, where they closely follow the contour of its surface. The platelets will fill up to 90 percent of the capillary void, producing a surface that is much smoother and more resistant to soiling. The overlapping of the platelets reduces the permeability of the treated surface, making it virtually impossible for moisture and other types of chemical agents to migrate through the protective coating to the base material.

The product can be applied by spray, brush, roller, sponge or immersion. Applications include painted steel, aluminum, stainless steel, galvanized metal, bronze, brass, plastic, rubber, Fiberglass, composite metals and varnished wood.

### **Super Water Repellent**

The filling of the capillary structures with Silicium nanoparticles produces a hydrophobic surface—one that repels moisture. The potential of a surface to be hydrophobic or hydrophilic (absorbs moisture) is based on many conditions, including temperature, relative humidity, material composition and static electricity. Surface condition is also a major factor. In most cases, a rough surface will increase the attraction of moisture. The smoother the surface, the more repellent it is to moisture, and the more repellent it is to moisture, the easier it is to maintain its cleanliness.

### **Contact Angle Measurement**

Permanon offers users a simple but effective way to monitor performance. Treatment causes the formation of large, closely spaced droplets when water is sprayed on the surface. This is known as the ASTM-22 “water break” test, which is used extensively in industry to monitor surface cleanliness. The size, shape and height of the droplets are measured by their contact angle with the surface. This contact angle is figured by a straight line that starts as the base of the droplet and travels along the outer surface to the break off point. The measurement between this line and the surface determines the contact angle. A contact angle measurement that reaches or exceeds 160 degrees is rated as an ultra-hydrophobic surface, indicating that the surface is extremely repellent to moisture. There are very few instances in nature of surfaces that exceed a contact angle of 160 degrees or more—the lotus leaf and bird feathers are examples. However, when Permanon is applied to a clean, hard surface, a contact angle measurement of 160 degrees is possible.

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## Capabilities

- Prevents dirt, dust, and grime from bonding to treated surfaces
- Protects surfaces against industrial pollution
- Repels airborne dust particles
- Eliminates the need for harsh chemical cleaners
- Reduces cleaning costs up to 50%
- Improves the clarity of glass and other transparent materials
- Resists temperature extremes from 40°C and 300°C
- Improves the “maintainability” of manufactured products