

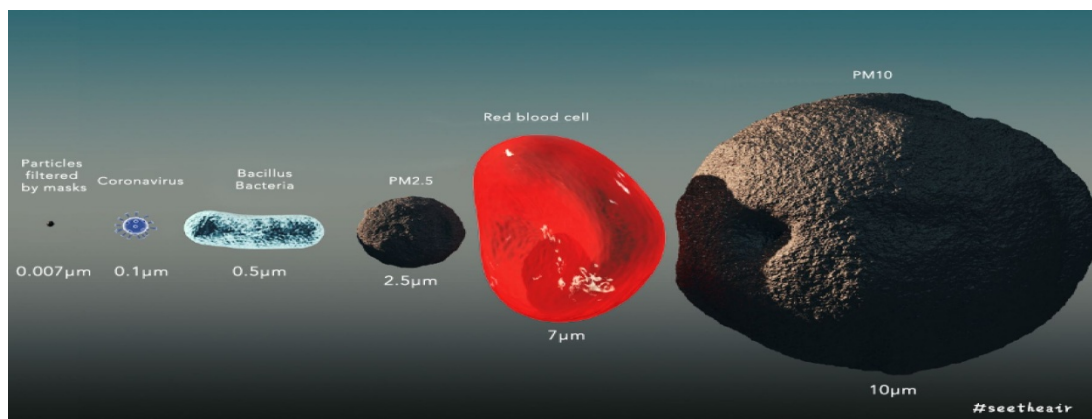
Nano-Clean / Corona Virus Article

Abstract

The corona virus has had a devastating social and economic impact on modern society. Currently, there is no cure for the virus and it may be 12 to 18 months before a proven vaccine is developed. Since the corona virus is highly infectious and easily transmitted surface cleaning has gained a critical new importance to control its spread.

Modern cleaners are designed to remove visible dirt and grime. Alcohol is added when germs and bacteria are present but, performance is still verified by the human eye which is limited to contaminants 50 micron in size (.0001959 of an inch) Visual inspections are not effective for the conivia virus which is about 90 nanometer in diameter or about a millionth the volume of the type of cells it infects in the human lung.

Size Comparision between the Convia Virus and other sub-micron cells and particles.



Nano-Clean is a strategically engineered cleaning process developed to address the limitations of traditional cleaning practices for micro-organisms. Nano-clean is based the science of nano-technology, or the creation and organization of materials, devices, or systems at the nano-level (one billionth of a meter).

The main component of nano-clean is silicium (also know as silicon) a component of glass and the same material used to produce modern computer chips. When silicium is incorporated in a micro-molecular polymer it is transformed into to an ultra thin protective coating. Silicum is not a cleaning material alone but, a protective coating designed to work in combination with high viscosity cleaners to disinfect the micro fissures of man made surfaces.

Glass is one of the easiest materials to clean due to its smooth hard surface. Silicium creates a surface similar to hardened glass which is easier to clean, and stays clean longer by surface modification at the microscopic level.

SILLICUM

Periodic Table Symbol Si

Atomic Number 14

Mohs Hardness 7

CAS-No. 7440-21-3

Traditional coatings contain a resin binder, pigments, and a solvent or water based carrier. Pigments provide color and improve chemical & abrasion resistance. The resin binder is the glue that holds the pigments in suspension. The solvent or water base carrier aids in film formation and evaporate away during the cure cycle. Adhesion is the result of mechanical and chemical interaction between the coating and the applied surface.

Antimicrobial Coatings.

These are special coatings formulated with special additives to kill germs and bacteria. These additives include silver, copper, and ammonium compounds. Antimicrobial coatings are widely used in hospitals and medical facilities and in recent years residential homes when owners have serious health problems such as asthma. Antimicrobial coatings are also effective in inhibiting the growth of mold and mildew. While effective for many applications antimicrobial coatings are expensive to apply and provide limited service life.

Nano-Clean

Nano-Clean provides a performance advantage over traditional cleaning practices and a cost advantage over antimicrobial coatings. Nano-clean has no color pigments or resin binder only silicium nano-particles. It is bonded to the surface by electrostatic attraction. This effect is produced by the positive charge of sillcum and the negative charge of the host surface. No reaction time is required. As soon as sillicum comes in contact with the base material the cure process is complete.

Sillicum nano-particles are not attracted to each other due to their uniform positive charge. During reapplication, silicium will seek out damage point locations, re-bonding with the base material to restore uniform film coverage. Excess material will simply rinse away. This eliminates the build-up of recoat materials and the trapping of contaminants between re-coat layers. This function is unique in the Coating Industry.

Reduced Cleaning Costs

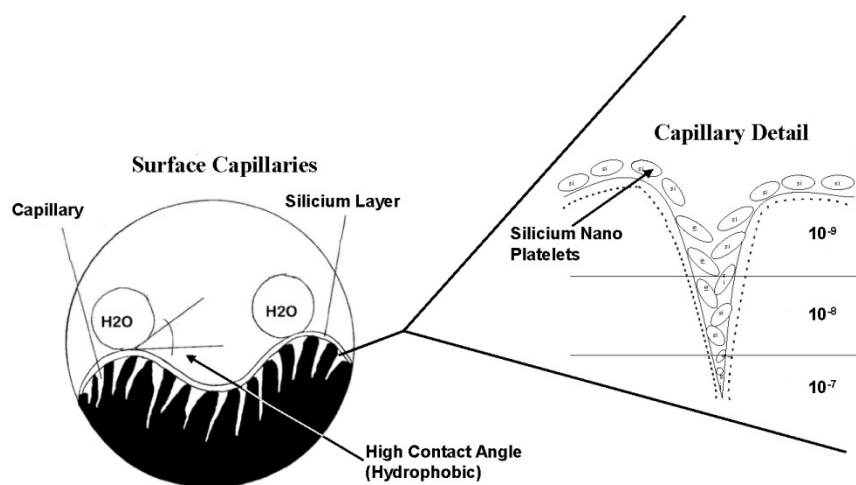
Microbes can double in number every 20 minutes on a manufactured surface. After microbes have begun to multiply constant cleaning is required to keep growth under control which is expensive and unreasonable in the majority of cases. Nano-clean replaces cleaning in response to visible soiling with preventive maintenance where silicium is introduced as a proactive coating to improve performance and reduce overall cleaning costs. A 50 to 80 % reduction in overall cleaning costs can be realized with the nano-clean maintenance program.

Self Cleaning

Repeated use of nano-clean produces a self cleaning advantage by The Van De Walls principal which occurs anytime two surfaces are close together. The closer the contact points the stronger the physical attraction. Since the silicium nano particles are constantly seeking to achieve a higher bonding level to a surface, contaminants are constantly being displaced. Water residue increases a surface's attraction of dirt, dust, and bio-agents. Silicium basically water-proofs a treated surface which reduces additional soiling.

How It Works

Virtually all natural and manufactured surfaces contain microscopic defects know as capillary structures. Under magnification these irregularities appear like the peaks and valleys of a mountain range. Dust, dirt, and chemical residue are absorbed into these voids where they are extremely hard to remove. Capillary structures also provide microbes with an excellent place to grow and multiply. Below, is an illustration of a capillary structure in comparison with a water molecule.



Nano-Clean Application Steps

1. Pre-Clean & disinfectant a contaminated surface
2. Apply silicium nano-coating
3. Check coverage by water break testing and contact angle measurement.
4. Perform maintenance cleaning with soap and water

Nano-clean fills the microscopic fissures with silicium nano-particles which prevents viruses, bacteria, and other pathogens from finding an ideal breeding ground which slows reproduction growth.

Advantages

Germ, bacteria, and virus concentrations are significantly reduced

Air-borne dust and dirt are repelled.

Water absorption and retention is eliminated

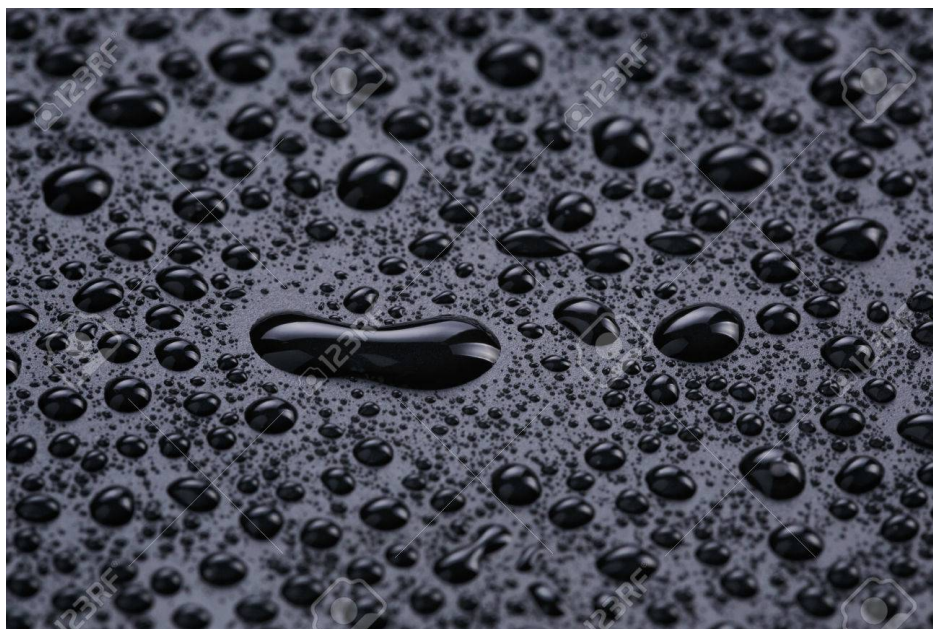
Reduces the need for aggressive and harmful cleaning products

Environmentally friendly and cost effective

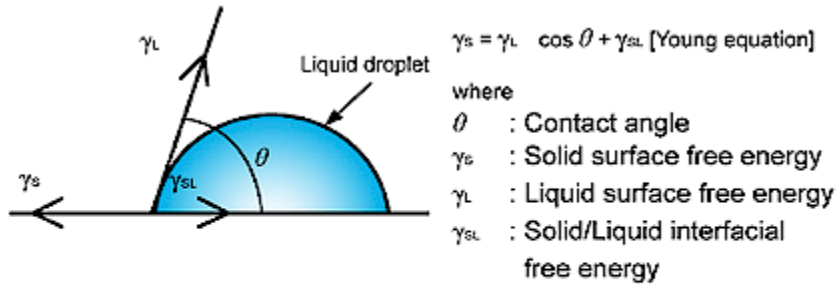
Water Break and Contact Angle Measurement

Nano-Clean provides a quality assurance advantage by ASTM F-22-02 water break testing in combination with contact angle measurement. Silicium produces a hydrophobic surface which is a surface that repels moisture in contrast with a hydrophilic surface that absorbs and retains moisture. A hydrophobic surface reduces the attraction of dirt, dust, and microbes.

Example of water beading on a hydrophobic surface



Water Break / Contact angle













Picture 2 - contact angle- the angle between the tangent line at the contact point and the horizontal line of the solid surface.

Contact angle is measured by a straight line that begins at the base of the water droplet and travels in a straight line to the break-off point. The higher the contact angle the more resistant the surface is to moisture absorption and retention.

The effective removal of organic contaminants depends on the type of surface involved. Smooth hard surfaces are easier to clean than porous or irregular surfaces. Below is the projected life span of the corona-virus on various surfaces.

How long the new coronavirus can live on surfaces*

SURFACE	LIFESPAN OF COVID-19
 Air	3 hours 
 Copper	4 hours 
 Cardboard	24 hours 
 Stainless Steel	2–3 days 
 Polypropylene plastic	3 days 

*At 69.8 to 73.4°F (21 to 23 °C) and 40% relative humidity

Source: New England Journal of Medicine

BUSINESS INSIDER

Testing

Testing will be an important part of the nano-clean introduction.

Specific items to consider

- 1) How silicium nano coatings adheres to surfaces
- 2) How micro cracks and fissures harbor pathogens
- 3) How the viscosity of modern cleaning products limit contact with submicron trenches
4. How surface condition affects cleaning performance
5. Why nano-clean improves cleaning performance by sealing micro surface imperfections
6. How Nano-clean reduces negative environmental impact produced by traditional cleaning practices.

Performance testing for nano-clean would be fairly simple. This would involve a control coupon and a coupon treated with the silicium nano-coatings. Water break testing would be performed on each panel to demonstrate the differences for water absorption and retention. Soiling of both panels with dirt, grime, and bio-contaminants would be performed to duplicate actual environmental conditions.

The control coupon would be cleaned using traditional cleaning practices and wiped down with clean cotton rag. The nano-clean treated coupon would be cleaned with soap & water and wiped down with a micro-fiber cloth*. Micro fiber clothes are designed to remove surface contaminants with microscopic hooks in the body of the cloth. This reduces the considerable amount of residue left by normal rags. Performance differences would be verified with a luminometer, an instrument used to accurately measure microscopic organic concentrations

Conclusion

This is little doubt there will be other pandemic attacks in the future. The development of a new generation of cleaning, disinfecting, and sanitizing technologies will become an important part of future societies.

Nano-Clean is based on a corrosion prevention program developed by Jim Deardorff, Superior Coatings for high value Farm machinery. Over a 10 year period between 2010 to 2020 the basic nano-clean process has been used on over 1000 individual projects including farm tractors, combines, cars, trucks, trailers, motor homes, boats, aircraft, construction equipment, and other high value assets. Early in 2020 Jim saw the potential of nano-clean to improve cleaning performance for the corona virus and other dangerous pathogens

Bio.

Jim Deardorff is the president of Superior Coatings based in Chillicothe, Missouri. Jim has over 25 years experience in the application and maintenance of protective coatings for high value equipment and steel structures. In 1991, Jim began researching new ways to extend coating life through planned maintenance. He has written over 50 articles and papers and regularly appears on RFD-TV "The Farm Station" providing advice on cost effective ways to reduce corrosion damage for Farm machinery and facilities. Currently, Jim is adapting established coating standards to include the Farm industry.

Recently, Jim has been accepted as a vendor for Missouri's conova- 19 supplier group.

Notes

Nano-clean is sold as a concentrate and mixed at a 1 to 10 ratio with distilled water which makes it very economical to use. Applied at film thickness is 100 nanometers (0.0000XX inch) coverage can exceed 2500 square feet per gallon. This is 10 times more than traditional paints.

On painted surface, microbes can double in number ever 20 minutes. After microbes have begun to multiple constant cleaning is required to keep growth under control which is expensive and unreasonable in most cases.

The main route of transmission of SARS CoV infection is presumed to be respiratory droplets. However, the virus is also detectable in other body fluids and excreta. The stability of the virus at different temperatures and relative humidity on smooth surfaces were studied. The dried virus on smooth surfaces retained its viability for over 5 days at temperatures of 22–25°C and relative humidity of 40–50%, that is, typical air-conditioned environments. However, virus viability was rapidly lost ($>3 \log_{10}$) at higher temperatures and higher relative humidity (e.g., 38°C, and relative humidity of $>95\%$). The better stability of SARS coronavirus at low temperature and low humidity environment may facilitate its transmission in community in subtropical area (such as Hong Kong) during the spring and in air-conditioned environments. It may also explain why some Asian countries in tropical area (such as Malaysia, Indonesia or Thailand) with high temperature and high relative humidity environment did not have major community outbreaks of SARS.

According to Graham, smooth, nonporous surfaces like doorknobs and tabletops are better at carrying viruses in general. Porous surfaces — like money, hair, and fabric — don't allow viruses to survive as long because the small spaces or holes in them can trap the microbe and prevent its transfer, Graham said. longer than SARS did: 24 hours, compared with eight hours.

COVID-19 likely originated in a Wuhan laboratory, not as a bio weapon but as part of [China's attempt to demonstrate that its efforts to identify and combat viruses](#) are equal to or greater than the capabilities of the United States, multiple sources told Fox News.

Antimicrobial Coatings.

These are special coatings formulated with additives that kill germs and bacteria. These additives include silver, copper, and ammonium compounds. These coatings are widely used in hospitals and medical facilities and in recent years residential homes when owners have serious health problems such as asthma. Antimicrobial coatings are also effective in inhibiting the growth of mold and mildew. Antimicrobial coatings are very expensive costing over \$200.00 a gallon plus application costs. Manufacturers claim antimicrobial additives also help paints last longer.

Many companies are adapting their operations to manufacturer products needed for the corona virus pandemic. For example, Ford Motor Company is producing ventilators to help corona patients breathe and Honeywell Aerospace Company is manufacturing N-95 face masks

Currently, there are xxxx cleaning workers in the United States. This will not be enough to address the corona virus pandemic especially if performance standards increase. It may be necessary to create a new professional work force trained in cleaning and disinfecting surfaces.