BIONI COATINGS I COMPETITIVE ANALYSIS FOR SO-CALLED NANO-COATINGS

Nanotechnology is a very wide field and the different ways to use nanotechnology cannot be compared. In paints , coating, and lacquers nanotechnology is used in the following ways:

Nano-SILVER Technology to achieve anti-microbial properties (Bioni Coatings)
Nano-TiO2 (Titanium Dioxide) Technology to reduce indoor pollution and destroy dirt on exterior facades (some paint manufacturers)
Nano-STRUCTURED paint surfaces ("Lotus-effect") to reduce dirt pick-up (some paint manufacturers)
Nano-CHRYSTAL Technology to achieve a harder surface which is resistant to mechanical stresses (especially used in exterior paints and the lacquers industry)

a) Nano-Silver

To be able to understand the difference of Bioni compare to other paints (also the ones who claim they use Nano-Silver-Technology) it's important to look at the following facts:

1. The important know-how concerning "Nano" is not the Know-How of manufacturing small Nano-Particles, but the Know-How to implement them in existing systems/products. To achieve the desired product functions the integration has to be done in a way which guarantees that the Nano particles still have the physical/chemical properties which they have when they would be free particles. The more demanding the base product, the more complicated is the integration. Especially the integration in liquid systems such as paints and coatings is a huge technical problem and challenge.
2. The properties of free Nano-Particles (such as the property “antimicrobial effect” of Nano-Silver-Particles) can change totally or even disappear if implemented in a system/product. Why ? Because if Nano Particles are integrated in a product they are not Nano anymore in the original meaning because they are covered and surrounded by other chemicals, such as the binding agent, fillers, additives, etc. Therefore the physical and chemical properties of the particles can change significantly.
3. When integrated in liquid systems such as paints and coatings, Nano-Particles re-agglomerate so that they are not Nano-particles anymore but micro-particles.
4. (Nano-)Silver has a good basic effect against bacteria. But the effect against fungus, mold and also algae is worse because these microorganisms, especially mold, are higher developed. Therefore it's necessary to create a catalytic effect to increase the efficacy of the Nano-Silver. Bioni's Nano-Silver particles are covered with a special, porous coat. Additionally special additives support the interaction between the nano-silver and the micro-organisms.
5. To achieve a durable resistance against micro-organisms such a fungus and mold the physical (and here especially the moisture regulating) properties of a coating or paint have to be taken into consideration. Nano-Silver technology alone is not able to solve mold problems. Therefore we use a binder-system-filler combination which fulfills in a perfect way the requirements concerning a physical support of mold prevention. Without such special physical properties of a paint surface a durable effect against micro-organism is impossible to achieve.

6. Nano-Particles can change the physical and chemical properties of the product where it will be integrated. To achieve an acceptable antimicrobial effect in a coating or paint it's not required to use such a huge amount of Nano-Silver that the paint or coating will be affected in a negative way, (i.e. it will be yellowish or grey and therefore not marketable anymore). It's significant part of our know-how to use a certain, critical amount of Nano-Silver which is high enough to achieve a durable effect against micro-organisms, but small enough to avoid negative effect on the other properties of a coating or paint (such as color, coverage, hiding, etc.).
7. The size, equal distribution, quality and additives to prevent the re-agglomeration is crucial for the efficiency and durability of a Nano-Silver-Paint and coatings. To find an optimal solution concerning these requirements was an important part of our 3 year research project with the Fraunhofer Institute.
8. There are paints and coatings using Silver Nitrate, Silver Salt or Nano-TiO2. The manufacturers claim a 99–99.9% reduction of bacteria. This sounds excellent but is only a 2-3-log reduction. Such a reduction is comparable with the natural reduction of many bacteria. Therefore there is no or only a small effect achieved by these paints and coatings. We proved that Bioni Hygienic paint and our System coating achieves -99,999% which is a 5-log reduction. A 2-log-reduction is almost comparable with the amount which will be destroyed in the air after some weeks anyway. This is something which Hygiene experts know. Therefore numbers behind the comma are very important.
9. Some paints and coatings using Silver Nitrate or Silver Salt claim that the anti-microbial resistance is a result of these chemicals, but scientists found out that most of these products contain (large quantities of) conventional biocides and fungicides to achieve the effects. The "Silver-claim is only used for marketing purposes.
10. Some companies are doing tests and "proof" the antimicrobial properties of their products with bacteria and germs that will not survive on any other surface (such as a normal paint) as well. This is unscientific.
11. Especially the development of an antimicrobial product requires much more than know-how in manufacturing nano-silver. It requires a huge biological knowledge regarding microorganisms, how they grow, what they avoid, etc. but also a huge buildings physics knowledge, especially regarding mold and mildew. A manufacturer who has no knowledge about fungus in buildings will not survive one year in the market because of technical problems and complaints. Bioni's products are in the market now for 5 years. These 5 years of practical experience and permanent product quality improvement cannot be caught up.
12. A Nano-Silver paint delivers an excellent protection against mold, bacteria and algae. However if a strongly mold-affected area has to be renovated the surface preparation is at least as important as the technology of the paint finish itself. In the case of existing mold problems very often many layers (paint, putty, plaster, epoxy) are affected by micro-organisms. In this case a simple surface disinfection is often insufficient. Parts of the microbial biomass behind the new paint or coating can survive, redevelop, grow through the paint or coating and appear on the surface again. Therefore it's necessary to take these processes into consideration. For the above described cases Bioni is using a specially developed mineral primer base coat which prevents microbial biomass from redevelop under the coated surface. This product is also unique and has passed worst-case-tests in combination with Bioni's Nano-Silver System top coat and paints.

b) Nano-TiO2

Many paint manufacturers have at least one photo catalytic Paint or coating in their range of products. These paints use Nano-Titanium-Dioxide (Nano-TiO2). ´Titanium Dioxide is a common white pigment. They claim that the Nano-TiO2 reduces dirt in the air and improves the room climate. It's also claimed that dirt on the facade will be destroyed so that the facade looks always clean. The technology is very simple and we could implement it immediately in our paints and coatings as well. But we don't believe that there is a significant effect and independent institutes doubt as well that such paints and coating really work, especially in interiors. It's fact that Nano-TiO2 is very reactive and has a destroying effect when stimulated by UV-light. However in interiors there is not enough UV-light (even if the manufacturers say it works anyhow) to achieve significant results. Additionally it's amazing that the lower the quality of the paint or coating and especially the binding agent the better is the "destroying effect" of the Nano-TiO2 inside the paint or coating. The reason for that is that the polymer-matrix / binding agent of the paint or coating which has picked-up dirt will be attacked by the reactive TiO2. So the lower the binding agent quality, the better is the photo catalytic effect. Based on these interactions and relations we don't see a benefit of such paints and coatings. It's a good marketing opportunity, nothing else. Mold, mildew, and algae attacks cannot be prevented by such products.

c) Nano-Structured Surface

This effect is 10 years old. Any silicon based paint or coating has a similar "easy-to clean" or "self-cleaning" effect. Algae and fungus cannot be avoided. Far from it! Latest investigations by scientists found out that nano-structured surfaces support the settlement of algae and fungus on facades because free water (which micro-organisms need to survive) is longer available on hydrophobic surfaces (such as "easy-to-clean" surfaces) compared to hydrophilic surfaces Additionally it has to be pointed out that the "self-cleaning" effect is only working in areas of the building which will be reached by the rain (so especially north and west facades of the building).

d) Nano-Chrystal Technology:

This kind of technology is used to achieve a better durability of exterior paints and a higher mechanical resistance of lacquers. The Nano-modified binding agents are more resistant against mechanical stresses and UV light. Other effects cannot be achieved. Long-term experiences are not available.