



ANTIBACTERIAL PROPERTIES FOR DECORATIVE COATINGS

Hauzer has been working on adding antibacterial properties to a range of decorative coatings based on titanium, zirconium and diamond-like carbon. The results of a recent test show that these modified coatings do indeed display antibacterial properties, while retaining the characteristics of the original coatings. This has drawn strong interest from customers in the decorative markets who want to expand their product line.

Roel Bosch, New Business Developer, says: "Many products with decorative physical vapour deposition (PVD) coatings are touched often or by many different people. Think of door handles and bathroom taps, in homes or even in hospitals, airports and schools. Research has shown that these surfaces commonly contribute to the spread of many bacterial and viral infections. Adding antibacterial properties to decorative coatings may be beneficial for public health and interesting to individual consumers. The antibacterial coatings would, of course, have to be as durable, corrosion and wear resistant and aesthetically pleasing as the unmodified versions."

Wide Range of Colours

Hauzer engineers took on the challenge of enhancing our main decorative coatings, which come in colours like nickel, brass, gold, bronze and various shades of grey to black. The goal was to add provable, durable antibacterial properties without making the coating process too complicated or losing other important properties.

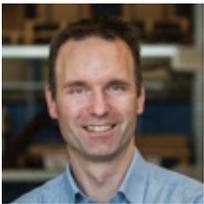
Samples of the modified coatings were analysed by researchers at Manchester Metropolitan University (MMU), who clearly saw an antibacterial effect: unlike the stainless steel reference sample, which held around 6 million colony-forming units per ml (CFU/ml) after 24 hours, no bacteria could be detected on the coated samples at all. The initial CFU level was taken at a very high level (much higher than in real cases) to clearly distinguish antibacterial activity. Roel explains: "The fact that bacterial activity nearly vanished in all samples after 24 hours is very promising, suggesting that bacterial colonies will be killed quickly in real life. We plan to investigate this in more detail this year."

The modified coatings have been checked and compared to the values for colour, roughness, adhesion and hardness that customers expect for these type of films. The measurements showed comparable material properties to the ones obtained from the unmodified process.

MMU METHODOLOGY TO TEST ANTIBACTERIAL EFFICACY

Modified Coatings Available Soon

Encouraged by the first test results, Hauzer aims to release these antibacterial coatings for the market by the beginning of 2019. For the second half of 2018, further experiments are planned to assess the speed of the antimicrobial action and to investigate the performance for a range of bacterial species, including key indicator species such as common skin bacteria *Staphylococcus aureus*. Roel: "The initial colour range of antibacterial coatings is promising, and we soon hope to add antibacterial properties to almost all standard decorative coating colours."



If you would like to learn more about antibacterial coatings for your application, please contact Roel Bosch (RBosch@hauzer.nl, +31 77 355 9746).

The testing methodology is based on BS ISO 22196:2011 (Measurement of antibacterial activity on plastics and other non-porous surfaces). MMU researchers inoculated *Escherichia coli* bacteria onto the coating and sandwiched it with a piece of polyethylene to ensure the cells are evenly spread across the surface. After 24 hours of incubation, any *E. coli* that were still alive were recovered from the surface and spread onto agar, allowing for the calculation of colony-forming units per ml (CFU/ml). All enhanced Hauzer coatings exhibited antimicrobial efficacy, reducing the number of CFU/ml to below the limit of detection.

ENHANCED TiN⁺, ZrCN⁺ AND DLC⁺ COATING EVALUATION

Material	Stainless steel (reference)	TiN ⁺	ZrCN ⁺	DLC ⁺
Coating Colour*	n.a.			
Anitbacterial properties				
Bacterial population after 24h [log CFU/ml]	6x10 ⁶	<10 ⁰ (not detectable)	<10 ⁰ (not detectable)	<10 ⁰ (not detectable)
Antibacterial activity	no	yes	yes	yes
Material properties**				
Colour		comparable	comparable	comparable
Roughness		comparable	comparable	comparable
Adhesion		comparable	comparable	comparable
Hardness		comparable	comparable	comparable
Corrosion		comparable	comparable	comparable

* Illustration of the corresponding colour on different surfaces: blasted (left), smooth (middle) and brushed (right)

** Compared to unmodified coating