Workshop »Coatings for Biomedical Applications«

Antimicrobial coating systems – Possibilities and Limitations

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Functional surfaces have become indispensable in technology. Coating technologies have been used in manufacturing technology for decades. Physical coating and nitriding methods have been industrialised and are often used in the field of wear protection, protection against corrosion or to change optical properties. Certain coating systems or substances can also kill viruses and bacteria due to their properties. Copper has long been known to be effective against viruses and bacteria and is used to protect wood or boat hulls. In the industrial environment, copper has a low resistance to wear and corrosion for large-scale industrial use, but at the same time it can be applied well to components using PVD technology. By selectively alloying the copper layer in the plating process, it was possible to achieve a significantly improved resistance to wear without negatively affecting the properties against viruses and bacteria. Alloy systems such as 1.4301 + Cu, CuOx + TiOx or CuCeAl - Ox showed the best results. The properties can be changed in different directions with the proportion of the alloy contents. The coating systems were tested against S.aureus, E.coli, Phi6 and Qbeta. Killing rates of up to 99.99% within 15 min were measured.At the same time, the targeted increase in wear and corrosion resistance has increased the service life of coated household utensils such as door handles from a few days to over 18 months. Tests are still ongoing.

An alternative technology to PVD coating is plasma activation of surfaces and subsequent immersion in liquids with the aim of bonding active substances to the surface.

One such substance is chlorhexidine, which has a wide range of applications in medical technology. In cooperation with Birmingham University (UK), a process was developed with which chlorhexidine can be firmly bonded to the surface of metals and plastics. Here, too, the coated surface shows comparable killing rates in a short time.

Limitations for antimicrobial surfaces exist on the part of approval and authorities. Approval must be granted in accordance with the applicable laws of biocide law or medical device regulation. Depending on the coating system and application, complex approval procedures must be observed.

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Professional Career: After three years abroad for commissioning of steel plants, started 2011 in research and development at Rübig. In 2015 I took over business development for the Rübig Group, and since 2020 I am a member of the Rübig Group Management Board, responsible for the Technology business unit and for business development and R&D across the Group.