Green and bio-inspired processes for the functionalization of surfaces.

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Due to its exceptional properties, stainless steel (SS) is widely used in the daily life (food industry, household appliances, surgery …).[1] However, it is unable to prevent bacteria from adhering, proliferating and forming a resistant biofilm over time. Therefore, surface modification is needed for providing durable antibacterial (AB) properties. Various techniques are used for imparting these AB properties to the substrate but are most often difficult to implement at the industrial scale and/or are not environmentally friendly procedures.

In this talk, we will discuss on new routes towards the preparation of long-lasting antibacterial coatings for stainless steel using aqueous-based and bio-inspired processes. We will first report on the design of a bio-inspired glue that is required for the strong adhesion of the functional coating on the substrate, and therefore for the long-term activity of the coating.[2] Then, various routes towards the functionalization of stainless steel with antibacterial coatings will be discussed. In this section, we will emphasize the role of catechol groups present on specifically designed novel polymers[3] (1) for the grafting of biocides to the surface and (2) for the film crosslinking in mild and aqueous conditions. Beside the formation and immobilization of silver based nanoparticles as biocides in the coating,[4] we will describe how the same catechol-bearing polymers can be exploited for the grafting of antibacterial peptides[5] and antibiofilm enzymes.[6] The long-term antibacterial/antibiofilm activity of the surface will be discussed. Finally, we will focus on how the deposition procedure of the active species can be simplified to render it industrially attractive by speeding up the deposition technique on stainless steel surfaces while maintaining a high and long-term surface activity.[7]

References

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