ANTIBACTERIAL SURFACES COVERED BY NANO ZINC OXIDE/SILVER COMPOSITE NANOPARTICLES: EVALUATION OF PHOTOCATALYTIC AND ANTIBACTERIAL ACTIVITY

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The contact with potentially pathogenic microbes found on different surfaces (e.g. doorhandles, medical equipment) may potentially harm our well-being. A promising method to reduce the spreading of unwanted microbes on surfaces is the development of antibacterial surfaces containing photocatalysts that induce the degradation of organic matter under specific illumination conditions. One suitable class of photocatalysts is metal oxides such as TiO_2 or ZnO. Two possibilities exist to increase the photodegradation efficiency of metal oxide materials: (i) increasing the specific surface area of the material [1] and (ii) implementing additives such as noble metals [2] to promote charge separation during photoexcitation. In this research ZnO nanoparticles were chosen as the photocatalyst and Ag as the noble metal. First, ZnO particles were synthesized using simple precipitation method. Next, Ag^+ ions were added and photoreduced to obtain ZnO/Ag composite particles. Spin-coating was used to cover glass substrates with ZnO/Ag composite particles. The photocatalytic activity of the prepared surfaces under UV light was evaluated by monitoring photodegradation of a thin layer of model dye (Brilliant Blue FCF) spin-coated onto the coatings. Antibacterial activity of the prepared coatings was tested according to a modified international standard (ISO 27447:2009(E)). In line with increased photocatalytic activity, the addition of Ag to the surface increased the antibacterial activity of the surfaces. However, the antibacterial efficacy of the surfaces was increased both, under UVA illumination as well as in the dark. Thus, the ZnO/Ag surfaces induced antibacterial activity both, due to the enhanced photocatalytic effect as well as due to the released Ag^+ ions from the surfaces. Our further studies will concentrate on the optimization of ZnO/Ag content of the surfaces for maximal antibacterial effect.

References

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