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Plasma curing of wet chemical deposited layers for antibacterial and photocatalytic surfaces

Daniel Glöß¹, Peter Frach¹, Andy Drescher¹, Klaus Rose², Johanna Kron², Holger Rothe³, Klaus Liefeith³, Thekla Kiffmeyer⁴, Michael Zimmermann⁵

¹Fraunhofer FEP, Dresden, Germany ²Fraunhofer ISC, Würzburg, Germany ³iba e.V. Heiligenstadt, Heilbad Heiligenstadt, Germany ⁴Institut für Energie- und Umwelttechnik, Duisburg, Germany ⁵IKHQ, Hochschule Anhalt, Köthen, Germany

Daniel.Gloess@fep.fraunhofer.de

TiO₂ in the anatase modification is a well-known photocatalytic material, that shows photoinduced hydrophilicity and photocatalytic induced oxidation and reduction reactions during UV-A irradiation. One possibility for the fabrication of photocatalytic coatings is the use of nanoscale TiO₂ particles. A combined wet-chemical and plasma based coating method was developed, that applies hybrid polymer precursors with immersed TiO₂ nanoparticles on atmosphere and uses a low pressure plasma for curing of the layers. During the plasma treatment curing is achieved simultaneously with the crosslinking of the layer. Additionally, the plasma etching effect partially exposes buried TiO₂ nanoparticles to the surface.

In this paper, the plasma curing process and corresponding investigations regarding different hybrid polymer precursors, plasma parameters and layer properties will be presented. Investigations regarding photocatalytic properties include photoinduced hydrophilicity, decomposition of methylene blue and of pharmacological substances as well as antibacterial effect and reduction of microbial colonization. For comparison also results of pure TiO₂ layers deposited by magnetron sputtering will be presented. Possible applications include medical devices, environmental engineering and coating of surfaces for antibacterial activity or easy to clean applications.

Keywords

plasma curing
TiO₂ nanoparticles
antibacterial
photocatalytic