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Generation of functional coatings by atmospheric pressure plasma spraying for medical and technical applications

Thorben Kewitz, Holger Testrich, Antje Quade, Angela Kruth, Uta Schnabel,
Klaus-Dieter Weltmann, Katja Fricke, Maik Fröhlich

INP Greifswald e.V., Greifswald, Germany

thorben.kewitz@inp-greifswald.de

Atmospheric pressure plasma spraying is a well-established method for film deposition providing unique process and coating properties including high deposition rate, high surface roughness, porous structure and the ability to coat a large range of materials including ceramics and metal-based materials. The versatility founds the diversity of applications ranging from the coating of turbines for corrosion protection and heat insulation up to the modification of medical implants aiming at the enhancement of the biocompatibility or to generate antimicrobial surface properties. Especially in healthcare facilities, infections pose a main challenge for implants due to the severe impairment of the quality of patient's life and the high costs involved. An approach to solve this problem is to promote the adhesion of human bone cells for a faster ingrowth of the implant and simultaneously, suppress the proliferation of microorganisms by the release of biocidal agents.

Within this presentation, we show results on the generation of innovative plasma sprayed coatings comprising hydroxylapatite - a cell adhesive bone-like mineral - and defined admixtures of antimicrobial agents (e. g. copper), which are released from the surface.

Furthermore, we will present results regarding the coating of high voltage electrodes with a ceramic material to reduce their abrasion significantly and drastically increase their lifetime by a factor of at least 50.

We are focusing on surface analysis by AFM, SEM, XRD and XPS along with microbiological tests and cell proliferation assays as well as on new approaches for material combinations used in plasma spraying processes, while also considering the effect of different particle sizes.

Keywords

plasma spraying
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coating
medical
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