

PO4029

Mechanical behavior of sputtered titanium coatings on structured Polyetheretherketon surface

Herbert Scheerer¹, Markus König¹, Anne Martin¹, Georg Andersohn¹, Markus Laub², Steffen Luers², Matthias Oechsner¹

¹Institut für Werkstoffkunde TU Darmstadt, Darmstadt, Germany ²MorphoPlant GmbH, Dortmund, Germany

herbert-scheerer@t-online.de

The enhancement for biological use of a structured polyetheretherketon (PEEK) surface with titanium by physical vapour deposition (PVD) was investigated. The quality of an implant is based on the characteristics of its surface and bulk material. The surface of an implant is responsible for the interaction with the biological environment and should be tailored for this. The surface topography and the surface physics are two characteristics which have to be in a specific range. There are a lot of investigations made for titanium implants which indicate an enhanced osteoconductive behavior with a particular topography. This topography is divided in micro- and nanoscale characteristic. In case of bulk material more polymers are used because of their radiological transparency, modelling ability's and more. But there are also investigations that through their inert characteristic they lag in osteoconductivity. Therefore a new approach was made to create an osteoconductive polymer surface with a topography according to established characteristics with the benefits of titanium. To achieve the aim PEEK was structured with different micro topographies and coated with titanium by physical vapor deposition (PVD) sputter technics. The topographies were measured by confocal microscopy before and after the coating process to prove the preservation of the generated structure. Direct current magnetron (DC), high power impulse magnetron sputtering (HiPIMS) and high frequency magnetron (HF) sputter technics were used. The coatings were investigated by micro- and macro scratch testing to characterize their mechanical behavior. Confocal microscopy, SEM and XRD measurements have been done to determine the behavior. A dependence of micro topography to the mechanical behavior of the coatings could be proven.

Keywords

PVD coating
structure surface
titanium
Polyetheretherketon
mechanical behavior