Workshop »Coatings for Biomedical Applications«

Fixation of ceramic monobloc implants using titanium vacuum plasma spray coatings

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The use of ceramic implants in the treatment of patients with hip joint arthrosis has been a proven method for decades. In most cases, a ceramic ball head articulates against a polyethylene monobloc cup or a polyethylene inlay in a modular metal cup. The metal cup is almost exclusively anchored without the use of bone cement by means of press-fit. In this case, the side facing the bone has a structuring, macroscopically porous surface or similar, which allow the bone ingrowth and thus the secondary fixation of the implant.

A ceramic-ceramic articulation represents an almost wear-free sliding pairing compared to the conventional restoration For this purpose, a ceramic inlay is inserted in the cement-free implanted metal shell instead of the PE-insert. Due to the necessary minimum wall thicknesses for metal cup and inlay, only small articulation diameters can be used with small acetabular diameters of the patients.

The aim of the development is the realization of a ceramic monobloc cup, which is also to be used directly without bone cement. In this way, a modular construction of the acetabular cup consisting of metal cup and ceramic insert is to be dispensed with and the use of larger sliding diameter couples such as 32mm and 36mm is to be realized even with physiologically predetermined small acetabuli.

For direct primary and secondary fixation of the ceramic Monobloc acetabular cup, a porous titanium coating is applied to the outside. This coating is realized via a vacuum plasma spray process.

In the presentation, characterization and properties of the bond between ceramic and Ti-VPS layer are presented.