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## **Development of Microplasma Spraying Technology for Applying Coatings from Biocompatible Materials onto Medical Implants**

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There are numerous ongoing researches in the area of manufacturing of the medical implants. One of the technologies for increasing the biocompatibility of implants is special surface treatments using microplasma spraying of biocompatible coatings. It has been shown by several previous research studies that hydroxyapatite (HA) is a good candidate as a bioactive and biocompatible material. Therefore we have chosen HA as the candidate material for the coating. It assists with the promotion of bone growth into the implant and facilitates the integration of the bone and implant. It is our objective in the current study to optimize the parameters of microplasma coating of hydroxyapatite onto endoprostheses of the hip joint in order to obtain the coatings with optimal structure phase composition and properties. The study was carried out on the pilot robotic industrial site for microplasma treatment of materials at the East Kazakhstan State Technical University. A sublayer of porous titanium with a thickness of 200-300  $\mu\text{m}$  and a porosity of around 150  $\mu\text{m}$  was sprayed onto the surface of a titanium based implant. Subsequently, a layer of HA with a thickness of the order of 200  $\mu\text{m}$  was deposited over the porous titanium layer. The impact of the main process parameters of micro-plasma spraying such as the amperage, plasma gas consumption, spray distance, HA powder or titanium wire consumption on the quality of the coatings was investigated. X-ray diffraction analysis and transmission electron microscopy were used for studying the structural-phase composition of coatings and substrates. The coatings morphology and porosity were investigated using scanning electron microscopy via ZAF PB, MicroCapture, Atlas software for Image processing. The adhesion strength of coatings made of HA with a titanium sublayer has been determined. The technological recommendations for applying bilayer microplasma coatings of titanium/HA onto hip implants were developed. Acknowledgements: the study has been conducted with state funding of the Republic of Kazakhstan by the project "Production of titanium products for further use in medicine"

### **Keywords**

microplasma spraying  
hydroxyapatite  
titanium