

DESCRIPTION FOR THE GENERAL PUBLIC

This project concerns the research of materials used, among others, in the aerospace, automotive and medical industries to produce implants for the bone repair and replacement. These will be porous sintered stainless steel 316L and titanium Ti64. Stainless steel 316L is one of the most common materials for the manufacture of biomedical implants because of the good mechanical properties, corrosion resistance and low costs when compared to other metallic implant materials. Whereas the titanium alloys have a much better mechanical properties, i.e. biocompatibility with living tissue, but their disadvantage is the relatively high price. Due to the properties, which would be difficult to obtain using solid materials, porous materials are increasingly used in industry.

Due to the difficulty of considered scientific problems in the project will be used advanced technologies. 3D printing technology, based on laser sintering layer by layer, will be used to preparation of the specimens for these studies. The opportunities offered by 3D printers, such as Direct Metal Laser Sintering and Selective Laser, cause that they are more frequently used by industry. In the studies will also be used a modern research equipment (X-ray computed microtomography) and software (Avizo Fire) to enable examination and to map the three-dimensional shape of porous structures. Additionally, in order to analyze the fracture surfaces of specimens, will be used scanning electron microscope. Kind of the conducted research will require the use of modern technologies in the full range of their capabilities, which may have effect on their development.

In recent years, computer modeling and simulation methods have made significant contributions to the understanding of the mechanical properties of porous materials in connection with their spatial structures. Numerical modeling based on finite element method will be carried out by advanced software MSC.Marc. Computer methods significantly impact on increase of cognitive possibilities about deformation and fracture processes of the investigated materials. Research within the scope of the project concerns the basic properties of porous metals, having decisive influence on their application in technology. Will be described the relationship between local mechanisms of deformation and fracture of porous metals, i.e. sintered alloys of steel 316L and titanium Ti64, on processes occur on a macroscopic scale. Realization of the project objectives allows to better understand the processes of deformation and fracture of local porous structures and their impact on the fracture on a macroscopic scale.