FABRICATION, STRUCTURE AND MECHANICAL PROPERTIES OF LASER SINTERED MATERIALS FOR MEDICAL APPLICATIONS

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Porous structures are very desired in medicine, especially where a porous element is to replace a missing bone. In such situation, the task of the element produced is to stimulate a regeneration process of the adjacent bone tissue. Ti/Ti6Al4V scaffolds fabricated with SLS technologies should be characterised by the appropriate size of pores, appropriate porosity, as well as the strength permitting usage in dental engineering as bone implants functioning as scaffolds, which become a substructure and support for the bone growing into them. Literature data shows that the size of pores allowing the development of the bone growth process into the created scaffold varies between the minimum of 50÷200 µm and the maximum of 500 µm, and the porosity of such scaffold should not exceed 50%. A satisfactory result of a manufacturing process of porous titanium materials is seen when an element is achieved with open pores, characterised by an appropriate level of porosity and sufficiently good strength properties. Ti/Ti6Al4V powders are materials utilised for fabricating real objects using Selective Laser Melting equipment. Manufactured metal scaffolds have shape and geometric dimensions corresponding to the bone loss of a particular patient thanks to application of the Computer Aided Materials Design method. The results of examinations of mechanical properties of pristine titanium and its alloy Ti6Al4V showing differences in the strength of the two materials and allowing to characterize each of them. The size of pores and the shape and manner of arrangement of a unit cell building the scaffold influences substantially the strength properties of titanium scaffolds.

Keywords: SLS, Ti/Ti6Al4V, porous materials, mechanical properties

References:


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