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The skeleton microporous materials with coatings inside the pores for medical and dental applications

A significant and costly problem of the modern medicine is the necessity to replace or supplement organs or tissues to prevent the biological and social degradation of patients and to restore their living functions, resulting from a growing number of cases of organ or tissue loss or damage in the human population due to post-injury or post- resection losses as well as those originating from the operative treatment of cancerous tumours or inflammation processes and as a result of the work, traffic and sports accidents. The own works covered by this article form part of completely original and pioneer research over the development of original author's concepts concerning the development of original hybrid clinical prosthetics and implantation techniques in the area of medicine and regenerative dentistry and tissue engineering methods allowing for the natural growth of living tissues into microporous parts of implanted medical devices. An engineering manifestation of such concepts is the creation of a new generation of original hybrid microporous high-strength engineering materials ensuring the development of original hybrid constructions of a new generation of personalised implant-scaffolds and tissue scaffolds. The most important is to develop an original hybrid technology of fabrication of a new generation of custom implant- scaffolds and tissue scaffolds using skeleton titanium or Ti_6AlV_4 alloy microporous materials manufactured by Selective Laser Sintering. They exhibit porosity and the related mechanical properties dependent on the manufacturing conditions, including mainly laser power, laser beam diameter and distance between laser beams and distance between laser remelting paths. In order to ensure conditions for the nesting and proliferation of living tissues in the micropores of the created porous microskeletons, tests were performed of the deposition of the internal surface of micropores with TiO_2 and Al_2O_3 layers by ALD technology supporting the growth of living tissues in a microporous bonding zone with scaffolds or implant-scaffolds created from engineering materials.

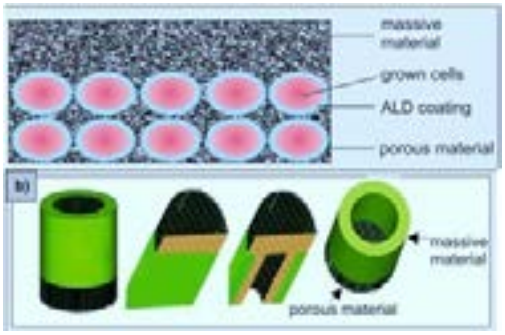

Figure 1: *The rigid biological-engineering material which may represent a microporous part of original implant-scaffolds with a microporous skeleton and deposited coatings by the atomic layer deposition method inside the pores supporting the growth and proliferation of living cells.*

Biography

Prof. Leszek Adam Dobrzanski is a Full Professor of Materials Engineering, Manufacturing Engineering , Nanotechnology, Medical and Dental Engineering in the Silesian University of Technology in Gliwice, Poland and a Supervisory Board Chairman, Project Manager and Principal Investigator in the Medical and Dental Engineering Centre for Research, Design and Production ASKLEPIOS Ltd in Gliwice, Poland. He is a Doctor Honoris Causa of the Universities in Bulgaria, Hungary and Ukraine. He is a Fellow of the Materials Science Committee of the Polish Academy of Sciences PAS and the President of the Metallic Materials Section of this Committee. He is a Vice President and a Fellow of the Academy of Engineers in Poland. He is a foreign Fellow of the Ukrainian Academy of Engineering Sciences and the Slovak Academy of Engineering Sciences. He is the President of the World Academy of Materials and Manufacturing Engineering, and a President of the International Association of Computational Materials Science and Surface Engineering. He is the Editor-in-Chief of the Journal of Achievements in Materials and Manufacturing Engineering, Archives of Materials Science and Engineering and Open Access Library.

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