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Modern methods of additive manufacturing for biomedical products

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Additive manufacturing (AM), due to its high potential for forming complex shapes in almost unrestricted manner, allows for creation of parts that cannot be produced with conventional technologies. The ability to locally control process parameters in additive manufacturing processes or the supply of two or more different materials allow for creating objects with different and unique properties. The application of those technologies opens up new possibilities for the design of modern implants, both in terms of geometric form, as well as programmed mechanical characteristics for optimal biomechanical implants, regarding interactions with the surrounding living tissues. Another aspect is the possibility of manufacturing bone scaffolds with diversified structure designed to support growth of functional bone tissue from patient's own stem cells seeded inside the implant with bioactive agents and customized implants or prostheses suited to the expected actual load, deformation and displacement resulting from an individual's anatomy and physiology basing directly on the data coming from medical CT scans. The capabilities of additive technologies to produce objects with geometries defined by computer 3D models, based on processing biocompatible metal alloys (e.g. CoCr, Ti and Mg alloys), bioceramics (e.g. hydroxyapatite) and biodegradable polymers (e.g. PLA, PLLA), however complex or intricate, have created a potential for solving many problems in medicine with its biological diversity of shapes and structures.

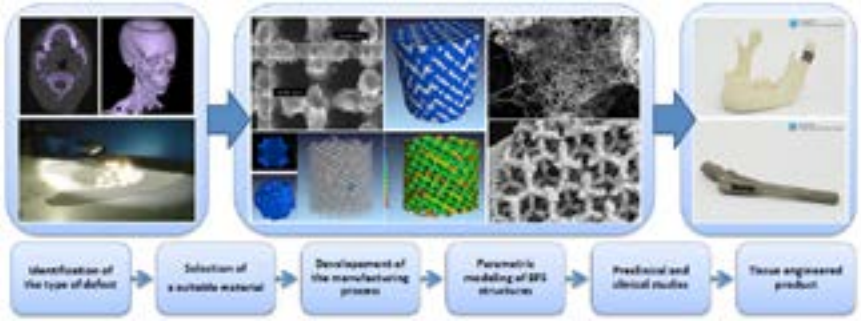

Figure 1: *Procedure for the fabrication of individualized biomedical products with additive manufacturing technologies.*

Biography

Patrycja Szymczyk received her PhD (2015) degree from the Wrocław University of Science and Technology, Poland. She is an Assistant Professor in the Faculty of Mechanical Engineering in the same university. Her current research interests are related to medical applications of AM technologies and includes the design, manufacturing and testing of advanced biomedical objects, such as biomechanical functional structures (BFS) for tissue regeneration, custom-made implants and smart drugs delivery systems for a wide spectrum of materials dedicated to the medical and pharmaceutical industry.

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