ABSTRACTS

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Extracellular matrix decellularization approaches for 3D tissue printing

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Keywords: 3D bioprinting, extracellular matrix, bioink, regenerative medicine.
Abstract: 3D bioprinting holds transformative potential for the field of regenerative medicine, offering unprecedented opportunities for the fabrication of complex, living tissues. Central to this technological innovation is the development of suitable bioinks that can accurately replicate the native cellular environment. Decellularized extracellular matrix (dECM) has emerged as a promising candidate due to its inherent biocompatibility, bioactivity, and structural resemblance to native tissues. Decellularization is a crucial process in tissue engineering that involves the removal of cellular components from the extracellular matrix (ECM) to create scaffolds suitable for tissue regeneration. This article provides a review of some decellularization methods, categorizing them into physical, chemical, and biological approaches. The article discusses the advantages and limitations of each method, highlighting the need to balance effective decellularization with the preservation of the ECM's functional properties. Understanding these methods is critical for developing optimized scaffolds for various tissue engineering applications.

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Production of biomedical filament and mechanical testing of samples produced by FFF additive technology

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Keywords: PLA, polymer, filament, filament maker, extrusion.

ABSTRACTS

Abstract: This scientific study, which brings completely new results, is characteristically divided into chapters where the authors deal with the extrusion mechanism, filament production, 3D printing of samples, and mechanical testing of samples. This research deals with a current topic in the field of production and testing of filaments composed of biodegradable polymers based on custom made PLA/PHB material. The authors of this study managed to produce and test a new type of biomaterial in the form of a filament called PLA BIOPOLYMER 20. The individual components forming this new type of material are described in the detailed statistics of this scientific article. After optimizing the parameters during single-screw extrusion on a filament maker, where the extrusion temperatures were set to 180° and the subsequent additive manufacturing of samples using FFF technology was started, where "dogbone type 5A" samples were printed. The authors managed to optimize the parameters of additive manufacturing and achieve significant results, which are also represented by individual printed samples, intended for subsequent mechanical testing, specifically for tensile testing. Important testing of materials for mechanical tensile tests was carried out according to generally applicable standards STN EN ISO 527-2, on the Inspekt table 5kN device. By mechanical testing, the individual stresses of the samples were determined. The average stress was 5.28 MPa. The authors compared the values obtained with samples printed from the new type of PLA BIOPOLYMER 20 material with the tension obtained with samples printed from pure PLA filament without admixture of other components. These tests are intended to determine the future application of the given material. This article brings new knowledge in the given field.

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Investigation of the influence of mechanical milling on magnetic properties of Fe powders

(pages 93-98)

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Keywords: soft magnetic materials, hysteresis loop, magnetic properties, iron powder.
Abstract: Nowadays, there is a global search for electromagnetic gadgets that are affordable, eco-friendly, and energy-efficient. This motivates engineers and scientists to develop new materials or enhance those that already exist. Fe-based soft magnetic materials are a significant class of soft magnetic materials that are essential to many energy-related industrial applications, including motors, converters, and electric transformers. This article focuses on the general characterization of magnetic materials, their magnetic properties and the analysis of the influence of mechanical milling of Fe powders prepared by mechanical milling in two different sizes (sample 1 – smaller then < 400 μm and sample 2 greater than > 400 μm). The experimentally obtained hysterical curves of ground Fe powders are measured using the Vibratimg Sample Magnetometer (VSM).

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Development of a robotic wheel door opener system assistive device

(pages 99-102)

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Keywords: mechatronics, assistive technology, physical disabilities, smartphone-controlled system.
Abstract: Physical disabilities significantly impact individuals' ability to perform activities of daily living (ADL), leading to reduced autonomy and difficulty to accomplish daily living tasks. One such barrier is the difficulty or inability to open doors, preventing access to different rooms in their residence (bathroom, bedroom, etc.), rooms at work, or shopping areas. Existing solutions, such as robotic arms on wheelchairs and door openers mounted at the top of doors, remain expensive, complex to install, and relatively difficult for the target population to use. Addressing this challenge, this study introduces a Robotic Wheel Door Opener System (RWDOS) designed to facilitate the opening and closing of the door. The RWDOS is installed at the bottom of a door and is controlled remotely through a smartphone application. The paper presents the mechanical design and control system along with a cost analysis. It concludes with initial results and outlines the future directions for the project.

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Prototype design and analysis of a mobile robot

(pages 103-107)

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Keywords: mobile robot, design, robot arm.
Abstract: Mobile robots are robots that can move on their own. Robots move in their environment, not fixed to a real location. With the flexibility of the navigation wheel combined with the dynamic system, the wheeled mobile robot is suitable for flexible movement on flat terrain, using tank-like tracks will be suitable for moving on difficult, complex, bumpy terrain. The article introduces a process of developing, designing a mobile robot combining a 4-degree-of-freedom arm with a mobile chassis. Kinematics, dynamics, strength of structure testing and simulation are all calculated in detail. Finally, a prototype was built and tested to prove the correctness of the process. The project has calculated the kinematics and dynamics of the model, thereby building trajectories, designing controllers for the vehicle and manipulator, thereby simulating problems on Matlab-Simulink. Designing 3D CAD models, building hardware, and testing CAE durability on Abaqus software. The results are visually tested by software, with high feasibility, is the premise for manufacturing.