

CURRENT TRENDS AND CHALLENGES IN 3D/4D BIOFABRICATION USING MULTIFUNCTIONAL SMART BIOMATERIALS AND NANOMATERIALS

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Biofabrication is a multidisciplinary research field combining principles from engineering, biology and material sciences through the application of multiple manufacturing processes to create bio-objects that mimic the architecture of living systems. Indeed, it debuted in scientific and technological scenarios as potential strategies for tissue engineering, regenerative medicine and related areas aiming the production of organoid models for drug screening and cosmetics evaluation, tissues for reconstruction and organs for transplantation. However, now other areas like agriculture and veterinary as well as the food industry can benefit from this exciting field. Probably, hydrogels represent the most essential building blocks for production of scaffolds and cells entrapment aiming biofabrication. Interestingly, natural polymers derived from agricultural, forestry and livestock products and by-products are the most largely used raw materials for production of hydrogels useful for biofabrication purposes since they are typically abundant, inexpensive, renewable, biodegradable, biocompatible and considered appropriate from chemical, structural and mechanical standpoints. More recently, nanomaterials have also attracted great attention for biofabrication due to their unique properties which arise from nanoscale and that offers a plethora of new possibilities to meet technical and scientific demands. A recent trend related to this scenario is the termed 4D biofabrication that goal to construct and fine-tuning 3D bio-structures through dynamic processes of self-assembly that could modulate their morphologies or functionalities over time, particularly when a certain chemical, biological, or physical stimulus is applied to smart materials or cell/tissue/organ post-processing self-organization and shape-morphing occurs. Indeed, it is expected that biofabrication will continue to break scientific paradigms and revolutionize researchers thinking process next years and the use of multifunctional smart biomaterials and nanomaterials may represent the next revolution in biofabrication at the cutting edge of technological innovation. In sum, this talk will highlight the current state-of-the-art of biofabrication field and discuss some recent advances and applications.

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