

Multifunctional materials and additive manufacturing for healthcare

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Over the past years, porous bioactive scaffolds with controlled functionalities, obtained via additive manufacturing of polymer-based compounds have attracted research interest in the field of tissue repair and regeneration. On the other hand, the design and the application of injectable systems and hydrogel-based composites able to promote the regeneration of soft tissues represents a crucial aspect for damaged tissue repair, also considering that such strategies could be used in reducing surgical invasiveness and in enhancing biomolecular interactions with cells. Furthermore, in order to repair bone, cartilage, intervertebral disc, adipose tissue, neural, and cardiac tissue, hydrogel-based materials have been widely analyzed as cell delivery systems providing a controlled release of drugs, proteins, cells, gene and other immobilized biomolecules. The suitable combination of 3D scaffold and hydrogels could provide high performance and functional systems, also focusing the attention on the possibility to control drugs or bioactive agent release. In this scenario, 3D polymeric and composite rapid prototyped scaffolds were properly designed and developed, by means of rapid prototyping technique. Different formulation of collagen and collagen-low molecular weight hyaluronic acid (LMWHA) were selected and combined with 3D scaffolds. The biological and chemico-physical performances of the proposed devices have been assessed. On the other hand, rheological and injectability tests were performed in order to obtain important information on the functional properties of the injectable systems in terms of viscoelasticity and flow behavior.

Recent Publications:

1. A Gloria, R De Santis and T Russo (2018) An analysis on the potential of diode-pumped solid state lasers for dental materials. *Materials Science And Engineering C* 92:862-867.
2. S Maietta, T Russo, R D Santis, D Ronca, F Riccardi, M Catauro, M Martorelli and A Gloria (2018) Further theoretical insight into the mechanical properties of polycaprolactone loaded with organic-inorganic hybrid fillers. *Materials* 11(2):312.
3. Zamuner M Cavo, S Scaglione, G Maria L Messina, T Russo, A Gloria, G Marletta and M Dettin (2016) Design of decorated self-assembling peptide hydrogels as architecture for mesenchymal stem cells. *Materials* 9:727.
4. Russo T, Tunesi M, Giordano C, Gloria A and Ambrosio L (2015) Hydrogels for central nervous system (CNS) therapeutic strategies. *Proceedings of the Institution of Mechanical Engineers Part H: Journal of Engineering in Medicine* 229(12):905-916.
5. De Santis R, Russo A, Gloria A, D'Amora U, Russo T, Panseri S, Sandri M, Tampieri A, Marcacci M, Dediu V A, Wilde C J and Ambrosio L (2015) Towards the design of 3D fiber-deposited poly(ϵ -caprolactone)/iron-doped hydroxyapatite nanocomposite magnetic scaffolds for bone regeneration. *Journal of Biomedical Nanotechnology* 11:1236-1246.

Biography

Teresa Russo obtained a PhD in Materials and Structures Engineering (Biomaterials) at the University of Naples, Italy. She is as a Researcher of the Institute of Polymers, Composites and Biomaterials (IPCB) – National Research Council of Italy – and her work is mainly focused on the possibility to combine additive manufacturing technologies, electrofluidodynamic techniques and multifunctional injectable gels for the optimization of multifunctional devices for tissue repair and regeneration. She is currently author of national and international papers, different book chapter and communications in international and national conferences. She has also been serving as an Editorial Board Member of reputed journals.

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