

Nanofilled electrospun fibers inspired by elastin and natural polymers

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Abstract

Electrospinning is an emerging technique with applications in tissue engineering for the high surface area to volume ratio and the interconnected pores of nanofibers. Blending of synthetic polymers as polylactic acid (PLA) and poly- Σ -caprolactone (PCL), together with natural proteins (Gelatin, Elastin) were conceived until now in order to obtain scaffolds with combination of strength and biocompatibility usually used in soft-tissue regeneration. Furthermore, the use of nanoreinforcements as bioglass and/or nanocellulose is aimed to overcome the limited mechanical performances of the scaffolds. In this work, we have successfully electrospun highly hydrophobic (PDLLA) and hydrophilic polymers (gelatin and a human tropoelastin-inspired sequence) together with bioglass microparticles and crystalline nanocellulose as nanoreinforcements in the perspective of future applications in hard-tissue regeneration (bone). Additionally, PDLLA was herein adopted for its faster degradation times in comparison to the most used PLA. The matrices were cross-linked in order to confer stability in water. Afterward, the matrices were tested concerning wettability, swelling and Young's elastic modulus. They show complete wettability and a significative decrease of Young's Modulus after swelling (comprised between 27 and 23 MPa). The value is analogous to that found for electrospun scaffolds composed of collagen, elastin and PCL. Funding: PON R&I 2014-2020 (572 PON_ARS01_01081).

Biography

Professor Bochicchio's research focusses on biopolymers and peptides inspired by elastomeric proteins for tissue engineering. Professor Bochicchio has authored 60 international peer-reviewed journal publications and Invited Speaker at 24 International Meetings. Professor Bochicchio's research has been supported by Italian Ministry of University and European Community and also attracts interest from multinational industrial partners. To date, she has secured \approx €1.8M (Co-I) research funding from National Operational Program "Research and Innovation" 2014-2020 in health sector. Professor Bochicchio has successfully supervised to completion 2 PhD student and 20 MSc students all of whom have remained in engineering/science and or academia. She is currently involved in the supervision of 1 PhD student. Additionally, she is currently mentoring one PhD research fellow.

