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Biopolymers based multifunctional composite systems by electrospinning technique

Ilaria Cacciotti
University of Nicholas of Cusa Studies, Italy

The formulation and development of multifunctional systems based on biopolymers (e.g. polycaprolactone, polylactide, polyhydroxyalkanoates, etc.) and natural and synthetic additives, both inorganic (e.g., calcium phosphates (CaP), bioglasses (BG), silica and calcium carbonate) and organic (e.g., agro-food byproducts, tannic acid and ascorbic acid), are gaining a lot of interest in order to provide innovative and improved properties, in terms of mechanical reinforcement, antioxidant and antimicrobial features for potential applications in the food packaging and biomedical sectors. In particular, in the food packaging sector the addition of proper fillers to biopolymeric matrices is strongly motivated by the need to improve their mechanical, thermal and gas barrier properties that avoid their industrial employment. Similarly, in the tissue engineering field several efforts are currently devoted to the devise of biomimetic multifunctional composites able to simulate the composition and/or the morphology of the tissue to be regenerated. Electrospinning is a low-cost and versatile technique which able to process several kinds of materials in fibers with large surface area-to-volume ratio and has recently emerged as a very promising approach, due to its ability to generate structures which well mimic those of the native tissue extracellular matrix typical of different biological tissues, and to entrap biomolecules, allowing their controlled release. Moreover, this technique occurs at ambient conditions, and, therefore is very suitable to encapsulate and stabilize thermolabile substances, ensuring their controlled release and their direct interaction with the environment, extending shelf life and food quality, in the case of food packaging applications. In this framework, composite fibrous mats were successfully processed by electrospinning. The obtained systems were fully characterized in terms of microstructural, thermal, and mechanical and biological properties by observation at scanning electron microscopy (SEM), X-ray diffraction, FT-IR spectroscopy measurements, differential scanning calorimetry (DSC), X-Ray diffraction (XRD) analysis, uniaxial tensile tests, and cytotoxicity tests.

Biography

Ilaria Cacciotti is an Associate Professor of Biomaterials, Tissue Engineering, and Material Science and Technology. She is the Coordinator for Engineering Area, member of the Research Committee and of the Board of PhD Course in Industrial and Civil Engineering at the Engineering Department of University of Rome Niccolò Cusano. She has graduated in Medical Engineering (Master of Science Award 'Fondazione Raeli'), completed her PhD in Materials Engineering, and has obtained II Level Master's degrees in Forensic Genetics and in Protection against CBRNe events. She has spent research periods at Kyoto Institute of Technology-Piezotech (Japan) and ITRI-Deakin University (Australia). Her research activity is mainly focused on the synthesis and characterisation of nanoceramic, polymeric and composite materials, in forms of particles, spheres, films, fibres, for biomedical and food packaging application. She was awarded with 8th CCT Award "Best Oral Presentation for Young Researchers", 10th International Award "Giuseppe Sciacca"-Young Students, European Biomaterials and Tissue Engineering Doctoral Award, "Young Researcher Award Elsevier-*Materials Science and Engineering: C*", "Top Cited Author 2011-2012 *ChemEngJ*", "Certificate of Excellence in Reviewing" (MaterChem and Phys 2013).

ilaria.cacciotti@unicusano.it