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Novel degradable biointerfacing nanocomposite coatings for modulating the osteoblast response

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Abstract

Design and functionalization strategies for bio-functional coatings based on biodegradable and biocompatible materials intended to be employed for targeting cells activity and enhancing the bio-response are essential for both research and clinical applications. Active compounds such as ceramics and/or proteins are used for enhancing cellular response. In the last years, recent studies showed that the distribution of ceramic nanoparticles such hydroxyapatite (HA) and Lactoferrin (LF) presence have significant influence for nano-composites interfaces for osteoblast response envisaging osseous implant application. Therefore, this work is focused on embedding HA spherical nanoparticles and lactoferrin (LF) within synthetic biodegradable copolymers Poly(ethylene glycol)-block-poly(ε−caprolactone) methyl ether (PEG-block-PCL Me) for the preparation of new nanocomposites coatings targeting the modulated response of osteoblast cells (i.e adhesion, mineralization). The controlled incorporation of HA and LF within the synthetic copolymeric substrates was performed by matrix assisted pulsed laser evaporation (MAPLE) method using a modular target system. The resulting morphologies and the main features were studied by Atomic Force Microscopy (AFM) and Scanning Electron Microscopy (SEM). Fourier Transform