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Structural investigation of bioactive TiO2 substrates functionalized by adhesion peptides derivatized with chitosan

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In the field of tissue engineering, a promising approach to obtain a bioactive, biomimetic, and antibiotic implant is the functionalization of a "classical" biocompatible material, for example, titanium, with appropriate biomolecules. For this purpose, we propose preparing self-assembling films of multiple components, allowing the mixing of different biofunctionalities "on demand". Self-assembling peptides (SAPs) are synthetic materials characterized by the ability to self-organize in nanostructures both in aqueous solution and as thin or thick films. Moreover, layers of SAPs adhere on titanium surface as a scaffold coating to mimic the extracellular matrix. Chitosan is a versatile hydrophilic polysaccharide derived from chitin, with a broad antimicrobial spectrum to which Gram-negative and Gram-positive bacteria and fungi are highly susceptible, and is already known in the literature for the ability of its derivatives to firmly graft titanium alloys and show protective effects against some bacterial species, either alone or in combination with other antimicrobial substances such as antibiotics or antimicrobial peptides. In this context, we functionalized titanium surfaces with the peptides alone (RGD and HVP) and with chitosan grafted to the same peptides (Chit-RGD and Chit-HVP). The chemical composition, molecular structure, and arrangement of the obtained biofunctionalized surfaces were investigated by surface-sensitive techniques such as reflection–absorption infrared spectroscopy (RAIRS) and state-of-the-art synchrotron radiation-induced spectroscopies as X-ray photoemission spectroscopy (SR-XPS), and near-edge X-ray absorption fine structure (NEXAFS).

Biography

Martina Marsotto is Ph.D student of "Material Sciences, Nanotechnology and Complex Systems" at Roma Tre University (Dept. of Science) of Rome (Italy), supervised by Assoc. Prof. Dr. Chiara Battocchio. Her research interests are biocompatible materials functionalized with appropriate biomolecules for applications in the field of tissue engineering. In particular, her Ph.D research project deals with the investigation of titania (a biocompatible material widely used in the field of implantology) surfaces modified with biomolecules, as for example oligopeptides or oligosaccharides, using Synchrotron Radiation-induced XPS, NEXAFS and FTIR spectroscopies. She has one paper, as first author.

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