

Biobone Symposium

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Prof. João F. Mano

Vice-director of 3B's research group, Department of Polymer Engineering, University of Minho, Portugal

ICVS/3B's - PT Government Associate Laboratory, Braga/Guimarães, Portugal

Open and closed polymeric three-dimensional structures for bone tissue engineering

Abstract: The development of devices for bone tissue engineering are often inspired by the composition and complexity of native bone tissue. At the lowest level of such organization, one should select the adequate biomaterials to be used as the building block of the structure that will support cells and control their behaviour towards the production of new tissue. We have been proposing the use of multilayered based arrangements that could be then integrated in more complex macroscopic devices, often exhibiting a hierarchical organization. Such nanostructured multilayered films may be assembled using oppositely charged polyelectrolytes through the layer-by-layer technology. Using adequate templates, non-flat coatings can be fabricated with tuned compositions along the build-up assembly. This enables the production of very well controlled multifunctional and structural devices using mild processing conditions that could be useful in biomedicine, including in bone tissue engineering. In particular we have been interested in developing more complex/hierarchical structures that could fulfil specific requirements in such kind of applications. Often multiple cell types should be integrated in such hybrid devices to recapitulate relevant biological features necessary to trigger the regeneration process. Examples of nano-stratified surfaces with tuned characteristics are presented, using polysaccharides or synthetic biomimetic macromolecules. Methodologies developed in our group will be exemplified, permitting the production of: (i) 3-dimensional nanostructured scaffolds for tissue engineering, enabling the support of cells in open porous structures; and (ii) multi-scale spherical objects to encapsulate cells, acting as “living” injectable or implantable devices.

Bio: Prof. Mano received his PhD in Chemistry in 1996 from the Technical University of Lisbon. Currently he is Associate Professor with habilitation at the Polymer Engineering Department, School of Engineering (University of Minho), and he is a vice-director of the 3B's research group, Biomaterials, Biodegradables and Biomimetics, which is a member of the ICVS/3B's Associate Laboratory. His current research interests include the use of biomaterials and cells towards the development of transdisciplinary concepts for biomedical applications, especially aimed at being used in tissue engineering of bone and cartilage and in the controlled delivery of bioactive molecules.