□ Poster ■ Oral

Synthesis and reactivity studies of bioactive glasses, contribution to the preparation of 3D structures by additive synthesis

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Abstract

Biomaterials represent a major therapeutic challenge for the upcoming century in an increasingly ageing population where trauma or bone loss is not uncommon. Among these biomaterials are bioactive materials, including bioactive glasses[1], which generate a series of physico-chemical reactions at the tissue/glass interface. These interactions in contact with biological fluids will allow the formation of a calcium phosphate apatitic phase similar to the bone mineral phase.
The trend in recent years has been towards tissue engineering, and more particularly computer-assisted tissue engineering (CATI) using these biomaterials[2], a practice that is growing in the medical field and is increasingly used in therapeutic procedures for bone reconstruction[3]. To do so, supports (also called scaffolds) are designed, using 3D printing, most often using biocompatible polymers coupled with mineral fillers such as bioglasses.
Among the biopolymers available in the world, polylactic acid (PLA) is one of the highest biopolymers produced globally.[4] This is partly due to its reliable cost and high abundance, but also to the fact that it has the advantage of being biocompatible and degradable in human body fluids and it can be assembled with other biocompatible materials such as bioglasses.[5]
Two different printing techniques were operated to design composite scaffolds using polylactic acid as the polymer and bioactive glass.[6,7] One using Fueled Deposition Modeling by Robocasting with a recently acquired robocasting printer (the EnvisionTec 3D Bioplotter, model Manufacturer), the second one with Fused Filament Fabrication using the Ender 3 Pro printer.
This talk presents the results of the study of the impact of the manufacturing parameters (pressure, shaping, mineral load, diameter of the needle used, etc.) on the composite scaffolds. These scaffolds, envisaged as materials for bone filling associated with cells, must be further characterized from a physico-chemical and biological point of view.

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