

**LABO - Axe et Equipe : ICCF - MPS**

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**Title of PhD subject :** Multi-scale characterizations of phosphocalcic bioceramic surfaces intended to stabilize bone loss.

**Summary :**

The extracellular matrix of bone tissue is a complex multi-scale material whose architecture is damaged by traumatic or osteolytic pathologies. Sometimes, these situations require the use of bone substitutes intended to stabilize the bone pieces in order to achieve healing/consolidation. Stabilization is essential to this process, hence the use of various immobilization and/or osteosynthesis solutions without which no consolidation can be obtained. In situ stabilization by a three-dimensionally personalized substitute for the loss of substance allows, through its precise and specific adaptation, to increase the stabilization of the bone piece compared to current solutions. If the three-dimensional appearance can be obtained by additive manufacturing of phosphocalcic bioceramics, the multi-scale characterization of the interfaces has not yet been studied. It is essential in order to optimize mechanical stabilization and biointegration. The purpose of this work is to carry out this characterization of interfaces: studies of nano/microstructures of surfaces according to manufacturing processes, optimization of micro/macro surface porosities with regard to stabilization in a spongy environment.

This work requires skills in additive manufacturing of bioceramics, 3D imaging modeling, characterization of surface roughness and the production of in vitro models for tribology studies.

Profile: The candidate will be able to modelize experimental processes in biomechanics and characterize (SEM, AFM) bioceramic surfaces that he (she) has manufactured.