FULLY INORGANIC DEPOSITION OF NACRE-LIKE LAYERS ON TITANIUM FOILS FOR IMPLANTATION

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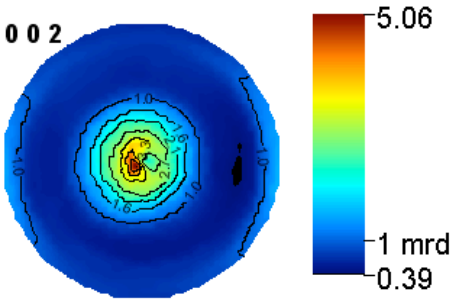
The calcium carbonate $CaCO_3$ crystallizes in three different forms in natural habitat, calcite, aragonite and vaterite. Calcite is used for a long time in bones prosthesis but this crystalline form gives rise to some drawbacks, like prostheses dislocations after 15 to 20 years. This is putatively due to the absence of ostéoinduction of this allotropic form. Vaterite is too much unstable to be used as human bone implants. On the other hand it has been proved that natural aragonite formed in nacreous layer of pearl oysters (like *Pinctada maxima*) is very biocompatible and ostéoinductive. In molluscs, the natural nacre layers are strongly textured.

This work focuses on the synthesis of nacre-like layers on titanium foils using an electrochemical way. In order to obtain calcium carbonate deposition, synthetic sea water is used as electrolyte. The aragonite form has been obtained by modifying some deposit parameters such as temperature, potential, etc…



To find the same properties than natural nacre, the most important aim is to synthesize highly-textured aragonite deposits. The growth of aragonite must be controlled to obtain aragonite c-axes mainly perpendicular to the foil surface (Figure). The aragonite microstructure resembles pseudo-hexagonal platelets as the ones found in natural mollusc layers. In order to characterise texture, structure and microstructures of the layers, we use 4-circle x-ray diffractometry in the "combined analysis" methodology. Several experimental conditions were spanned and systematic characterisation used which helped stabilising textures with {001} pole figures culminating around 5 mrd, as a sign of a significantly strong texture. The obtained textures mimic some class of gastropods nacre layers, like *Tectus niloticus*.