3rd International Conference on
BIOMATERIALS, CELLULAR AND TISSUE ENGINEERING
June 19-20, 2019 | Dublin, Ireland

Saida Somrani et al., Mater Sci Nanotechnol 2019, Volume 3

TO IMPROVE THE BIOACTIVITY OF THE BIOMIMETIC APATITE BASED BIOMATERIALS

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Bone is a cellular hydrated organo-mineral composite. It promises mechanical, protective and metabolic functions allowing the locomotion and maintaining body's cells alive. The major mineral phase is a Ca-P apatite. The nascent nanocrystals of this bioapatite, which are poorly nanocrystallized are distinguished by the presence of two adjacent environments. The first one is the bioapatite internal core. It is similar in structure to that of hydroxyapatite (Ca10 (PO4)6(OH) 2) built with tri-structured stable apatitic species. They are surrounded by hydrated shells containing bi-structured non apatitic species which are characterized by their ability to exchange with the body fluid entities. With age, bone mineral is the seat of many events and modifications usually named maturation process. At the beginning of its formation, bone mineral is formed with poorly nanocrystallized bioapatites which are non-hydroxylated, freely or weakly carbonated and rich in water. Despite, in the ageing, the bioapatite becomes hydroxylated and more carbonated, leading to the alteration of the bone bioactivity. In the biomaterials field, the use of the biomimetic Ca-P apatite's, that have chemical and structural characteristics emulating the mineral bone behaviors, has raised interest to assure the biocompatibility and favor the osteoconductivity of the implants. The purpose of this study is to contribute to a better understanding of bone mineral maturation process from the neoformation to ageing in order to improve biomimetic apatite based orthopedic biomaterials. A comprehensive study of two sets of biomimetic apatites was undertaken. The first series which is free carbonate is analogous to the young bioapatite while the second is similar to the mature or aged bone mineral. The experimental results were statistically treated by ANOVA univariate and bivariate regressions ($p<0.05$). The obtained data highlighted the physicochemical characteristic that enabled an early diagnosis of bone fragility to improve the characteristics of biomimetic apatites for making the orthopedic biomaterials.

BIOGRAPHY

Saida Somrani is a Professor of Chemistry in Tunis University. She is a Director of the Research Unit 'Material and Environment', at the Preparatory Institute for Engineering Studies of Tunis (IPEIT). Her research activities have been focusing in particular on nano- and bio-material sciences and bio-sourced chemistry for biological applications essentially (orthopedic and dentistry biomaterials, bone) using physicochemical and thermodynamic approaches. She is a co-author of articles and a chapter in biomaterials in Wood head publishing limited series: Bio-ceramics and their clinical applications. Selmi M has got a Diploma in Analytical Engineering from the Faculty of Sciences of Tunis. She has obtained her Master's Degree from the National Institute of Applied Sciences and Technology (INSAT). She has got her PhD which has been supervised by S Somrani at the Preparatory Institute for Engineering Studies of Tunis (IPEIT) in April 2017. She taught engineering studies in IPEIT. She has a publication in *Journal of Materials and Environmental Science*.

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