EuroSciCon

October 04-06, 2018
Amsterdam, Netherlands

EuroSciCon Conference on
Nanotechnology & Smart Materials

Nano Res Appl Volume:4
DOI: 10.21767/2471-9838-C6-025

ADSORPTION ONTO APATITES AND APPLICATION TO BIOMATERIALS

Allal Barroug[1, 2], H Noukrati[1], H Ait Said[1], S Cazalbou[3], H Oudadesse[4], C Combes[3] and C Rey[3]

[1]University Cadi Ayyad, Morocco
[2]MSN-CIAM, (Mohammed VI Polytechnic University, Morocco
[3]CIRIMAT-PPB, INPT-CNRS-UPS, University of Toulouse, France
[4]ISCR, UMR CNRS 6226, University of Rennes 1, France

Calcium phosphates (CaP) have been widely used in the medical field as synthetic bone substitute and as carrier for targeted delivery applications. The apatite materials are similar to the bone mineral phase in terms of composition and biological properties and have the ability to form strong bonds with the bone tissues. Thus, it is needed to gain better understanding on the CaP biomineralization process as well as their interaction with biological environment in the living systems. This study aims at investigating under various conditions, the adsorption of polyanionic biomolecules onto synthetic CaP nanocrystals, in order to elucidate the effect of mineral active ions and the role of the functional groups in the uptake and release processes. The results revealed that equilibrium conditions were mostly reached within a short time of contact, attesting of the high surface reactivity of the apatite crystals. Biomolecules containing active end groups interact strongly with apatite crystals and are generally characterized by higher adsorption parameters, leading to isotherms Langmuirian in shape. Inversely, weak interaction occurs for simple molecules; the evolution of the loaded amount adsorbed for the latter, as a function of its remaining concentration in solution, conformed to the Freundlich-type isotherm. Furthermore, the process was irreversible with respect to dilution, while the adsorbed molecules were displaced when active species were added to the medium. A deep investigation of the uptake-release onto/from apatite surface indicated that adsorption for dilute solutions could be described as an ion-exchange process involving the functional groups of the molecules and the ionic groups at the apatite surface. For concentrated solutions, the interaction appears to be reactive and the adsorption process could then be described as a multifactor phenomenon. The present study indicated that control of the loading and release capacity of CaP materials is required to design drug delivery systems that meets the clinical needs.

a.barroug@uca.ma