

Poster Presentations

[MS24-P28] Surface Modification of Calcium Hydroxyapatite by Grafting of Etidronic Acid.
Mongi Debbabi^a, Masseoud Othmani,^a Abdallah Aissa,

^a*Laboratoire de Physico-Chimie des Matériaux, Faculté des Sciences de Monastir, 5019 Monastir, Tunisia*

E-mail: m.debbabi@yahoo.fr

Hydroxyapatite (CaHAp) has a very reactive surface, due to the presence of two different functional active sites $\equiv\text{CaOH}$ and $\equiv\text{POH}$ [1]. Therefore, the modification of CaHAp surface with various organic substances has been the subject of many studies that give novel functions to this material. In this framework, different processes of fixation have been proposed based on the interactions between calcium or phosphate ions on the apatite surface and the anionic groups of the organic molecule. The inorganic–organic hybrids obtained have interesting applications in catalysis [2], chromatography [3], biomedical domain [4] and as adsorbents for removal of heavy metals [5]. The aim of the present study was to change the surface nature of CaHAp particles via grafting process. The surface of prepared calcium hydroxyapatite CaHAp has been modified by grafting the etidronate (ETD). For that purpose, CaHAp powders have been suspended in an aqueous etidronate solution with different concentrations. The hybrid materials obtained CaHAp-(ETD) were characterized by transmission electron microscopy (TEM) and atomic force microscopy (AFM) techniques to determinate morphological properties and were also characterized by X-ray diffraction (XRD), infrared (IR), nuclear magnetic resonance (NMR) and chemical and thermal analysis to determinate their physico-chemical properties and essentially the nature of the interaction between the inorganic support and the grafted organic ETD. After reaction with ETD, XRD powder analysis shows that the apatite structure remains unchanged with slight affectation of its crystallinity. The presence

of ETD fragment bounded to hydroxyapatite was confirmed by IR and solid-state NMR spectroscopy. TEM and AFM techniques indicate that the presence of ETD changes the morphology of the particles. Basing on the obtained results, a reactional mechanism was proposed to explain the formation of covalent Ca–O–Porg bonds on the CaHAp surface between the superficial hydroxyl groups ($\equiv\text{Ca-OH}$) of the apatite and phosphonate group (P-OH) of ETD.

[1] S. Saoiabi, S. EL Asri, A. Laghzizil, T. Coradin, K. Lahlil, *Materials Letters* 64 (2010) 2679–2681.

[2] M. Zahouily, W. Bahlaouan, B. Bahlaouan, A. Rayadh, S. Sebtib, *Arkivoc* xiii (2005) 150–161.

[3] Q. Liu, J.R. de Wijn, K. de Groot, C.A. van Blitterswijk, *Biomaterials* 19 (1998) 1067–1072.

[4] D. Fukegawa, S. Hayakawa, Y. Yoshida, K. Suzuki, A. Osaka, B. Van Meerbeek, *Journal of Dental Research* 85 (2006) 941–944.

[5] O.G. da Silva, E.C. da Silva Filho, M.G. da Fonseca, L.N.H. Arakaki, C. Airoidi, *Journal of Colloid and Interface Science* 302 (2006) 485–491.

Keywords: apatite; biomaterials; surfaces