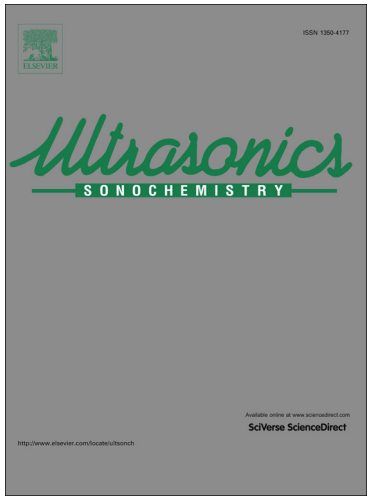

Effect of employing ultrasonic waves during pulse electrochemical deposition on the characteristics and biocompatibility of calcium phosphate coatings

Leila Fathyunes, Jafar Khalil-Allafi

PII: S1350-4177(17)30557-6
DOI: https://doi.org/10.1016/j.ultsonch.2017.11.041
Reference: ULTSON 3978

To appear in: *Ultrasonics Sonochemistry*

Received Date: 14 October 2017
Revised Date: 28 November 2017
Accepted Date: 28 November 2017

Please cite this article as: L. Fathyunes, J. Khalil-Allafi, Effect of employing ultrasonic waves during pulse electrochemical deposition on the characteristics and biocompatibility of calcium phosphate coatings, *Ultrasonics Sonochemistry* (2017), doi: https://doi.org/10.1016/j.ultsonch.2017.11.041

Effect of employing ultrasonic waves during pulse electrochemical deposition on the characteristics and biocompatibility of calcium phosphate coatings

Leila Fathyunes[a*], Jafar Khalil-Allafi[b]

[a, b] Research Center for Advanced Materials, Faculty of Materials Engineering, Sahand University of Technology, 5133511996, Tabriz, Iran.

[*] Corresponding author: E-mail: fathyunes.metallurgy@gmail.com

Abstract:

In the present work, we investigated the effect of employing ultrasonic waves during pulse electrochemical deposition on surface topography, chemical composition and biocompatibility of calcium phosphate (Ca-P) coatings. The SEM and 3D AFM images showed that the anodized titanium surface was covered with the uniform and refined size of plate-like Ca-P crystals, when the ultrasonic treatment of the electrolyte with power of 60 W was carried out during deposition. In contrast, for the Ca-P; 0 W coating applied under only the magnetic stirring of the electrolyte, the microstructure was non-uniform and some Ca-P crystals with the larger size were randomly observed in different regions, causing a rougher surface. The FTIR results also revealed that employing the ultrasound increases the deposition of a coating involved in only the most stable Ca-P phase of carbonated hydroxyapatite (CHA). However, in the absence of ultrasound, besides the prominent phase of CHA, some less stable Ca-P phases like octa calcium phosphate (OCP) and brushite were also formed in the Ca-P; 0 W coating. The Ca-P; 60 W coating showed the higher ability for apatite biomineralization after a 7-day immersion in the simulated body fluid (SBF). This coating also provided a better surface for the cellular activity, as compared to the Ca-P; 0 W coating.

Keywords: pulse electrochemical deposition, ultrasonic waves, calcium phosphate coating, apatite biomineralization, biocompatibility.