

## Accepted Manuscript

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PII: S0141-8130(17)32011-1  
DOI: <http://dx.doi.org/10.1016/j.ijbiomac.2017.09.017>  
Reference: BIOMAC 8190

To appear in: *International Journal of Biological Macromolecules*

Received date: 5-6-2017  
Revised date: 24-8-2017  
Accepted date: 6-9-2017

Please cite this article as: B.Kaczmarek, A.Sionkowska, A.M.Osyczka, The application of chitosan/collagen/hyaluronic acid sponge cross-linked by dialdehyde starch addition as a matrix for calcium phosphate *in situ* precipitation, *International Journal of Biological Macromolecules* <http://dx.doi.org/10.1016/j.ijbiomac.2017.09.017>

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The application of chitosan/collagen/hyaluronic acid sponge cross-linked by dialdehyde starch addition as a matrix for calcium phosphate in situ precipitation

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Abstract

Scaffolds based on chitosan, collagen and hyaluronic acid, cross-linked by dialdehyde starch were obtained through the freeze-drying method. The porous structures were used as matrixes for calcium phosphate in situ precipitation. Composites were characterized by different analyses, e.g. infrared spectroscopy, SEM images, porosity, density, and mechanical tests. Moreover, an examination involving the energy dispersive X-ray spectroscopic method was carried out for the calcium and phosphorus ratio determination. In addition, the adhesion and proliferation of human osteosarcoma SaOS-2 cells were examined on the obtained scaffolds.

The results showed that the properties of the scaffolds based on chitosan, collagen, and hyaluronic acid can be modified by dialdehyde starch addition. The mechanical parameters (i.e. compressive modulus and maximum compressive force), porosity, and density of the material were improved. Calcium phosphate was deposited in the scaffolds at the Ca/P ratio ~2. SEM images showed the homogeneous structure, with interconnected pores. The cross-linker addition and an inorganic compound precipitation improved the biocompatibility of the scaffolds. The obtained materials can provide the support required in tissue engineering and regenerative medicine.

key words: calcium phosphate, dialdehyde starch, SaOS-2 attachment

## 1. Introduction

Scaffolds are porous biomaterials which have found applications in tissue engineering science. They can be obtained by different methods such as freeze-gelation or freeze-

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