

Accepted Manuscript

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S. Petisco-Ferrero, L. Pérez Álvarez, L. Ruiz-Rubio, J.L. Vilas Vilela, J.R. Sarasua



PII: S0266-3538(17)33255-4

DOI: [10.1016/j.compscitech.2018.04.001](https://doi.org/10.1016/j.compscitech.2018.04.001)

Reference: CSTE 7163

To appear in: *Composites Science and Technology*

Received Date: 21 December 2017

Revised Date: 1 April 2018

Accepted Date: 2 April 2018

Please cite this article as: Petisco-Ferrero S, Pérez Álvarez L, Ruiz-Rubio L, Vilas Vilela JL, Sarasua JR, Plasma poly(acrylic acid) compatibilized hydroxyapatite-poly(lactide) biocomposites for their use as body-absorbable osteosynthesis devices, *Composites Science and Technology* (2018), doi: 10.1016/j.compscitech.2018.04.001.

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PLASMA POLY(ACRYLIC ACID) COMPATIBILIZED HYDROXYAPATITE-POLYLACTIDE BIOCOMPOSITES FOR THEIR USE AS BODY-ABSORBABLE OSTEOSYNTHESIS DEVICES

**Petisco-Ferrero, S.^{1,2*}, Pérez Álvarez, L.², Ruiz-Rubio, L.³, Vilas Vilela, J. L.³,
Sarasua, J. R.¹**

¹ Department of Mining-Metallurgy Engineering and Materials Science & POLYMAT, University of the Basque Country, Faculty of Engineering of Bilbao, Alameda de Urquijo s/n, 48013 Bilbao, Spain

² Currently at: Eindhoven University of Technology, Polymer Technology, Eindhoven, the Netherlands

³ Dpto. Química Física, F. de Ciencia y Tecnología, Universidad del País Vasco (UPV/EHU), Apdo. 644, 48080 Bilbao, Spain

* Corresponding author: E-mail address: susana.petisco@ehu.eus (S. Petisco Ferrero)

Abstract

The nanoscale interface between hydroxyapatite (HA) particles and PLLA matrix appears to be the determining factor for poor mechanical performance of this family of biocomposites in load-bearing applications. It has been demonstrated that when these biocomposites are loaded, the physical adsorption between inorganic particles and polymeric matrix does not allow for load transfer and additional free surfaces that act as crack nucleators are created. To overcome this limitation, we propose plasma polymerization of poly(acrylic acid) (PAA) on HA particles as an effective method to produce strong interactions with the polylactide (PLLA) matrix. In this work, evidences of an intimate bonding between HA_{PAA} particles and PLLA are given. Based on the thermodegradation behaviour of the composites it was found that the plasma deposited layer arrested free hydroxyl groups of PLLA chains, hindering the transesterification reactions that cause the thermal degradation of PLLA. As a result, thermal degradation of the composites was retarded and followed the chain scission route producing acetaldehyde, CO and CO₂. From the mechanical characterization it became clear that load transfer was developed by means of the PAA compatibilized interface resulting in the observed enhancement of the elasticity and damping behaviour of the biocomposites.

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